AGRICULTURAL *Chemicals*

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- Fertilizer Marketing Program
- Pesticides on Highways
- Calcium Phosphates
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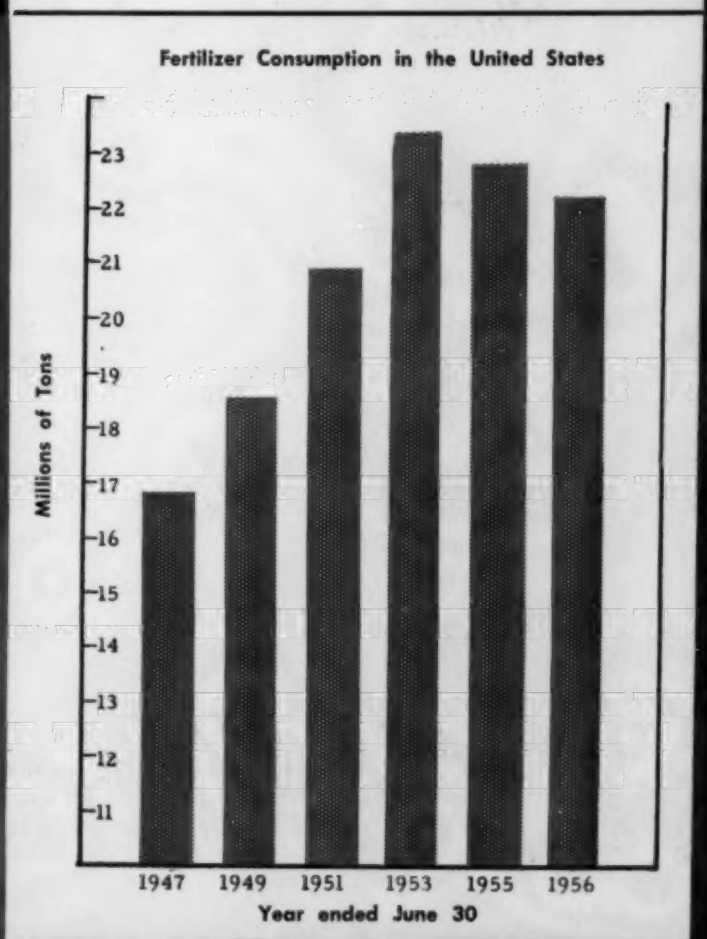
July 1957



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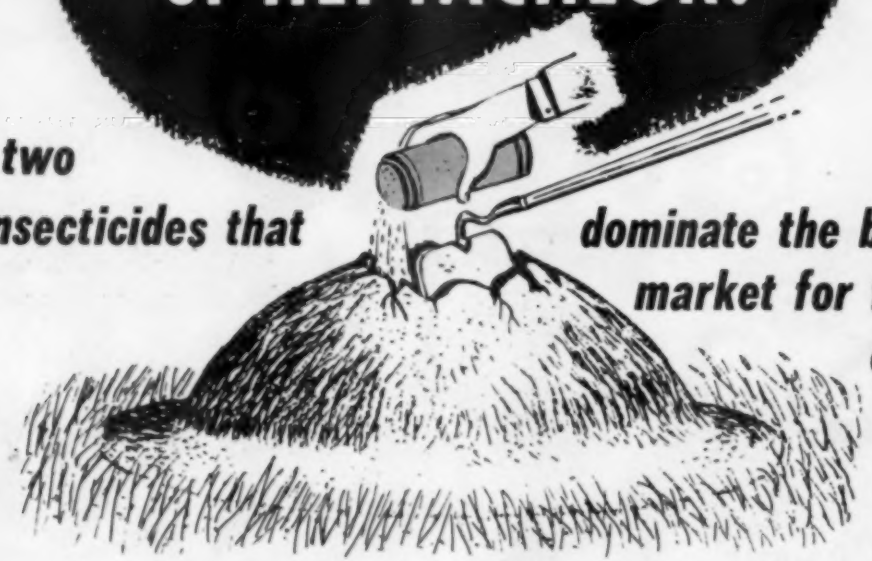

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This Month's Cover

For the third successive year, there has been a decline in the volume of fertilizer consumed in the United States. Complete figures appear on page 65.

Vol. 12, No. 7 July, 1957

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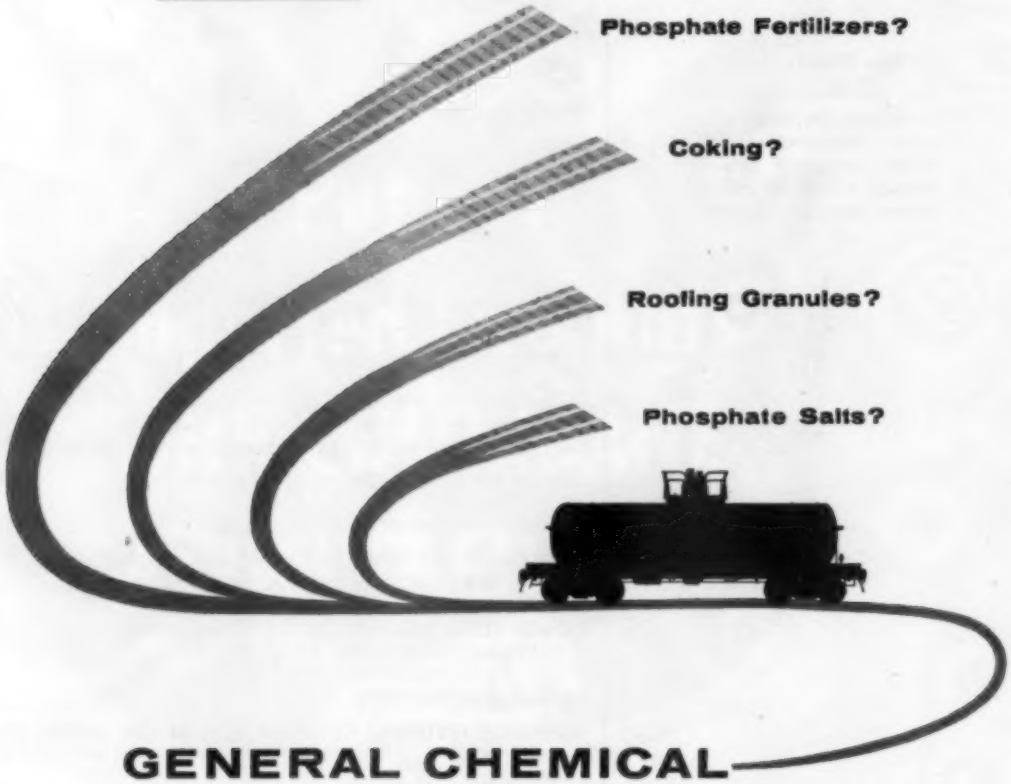

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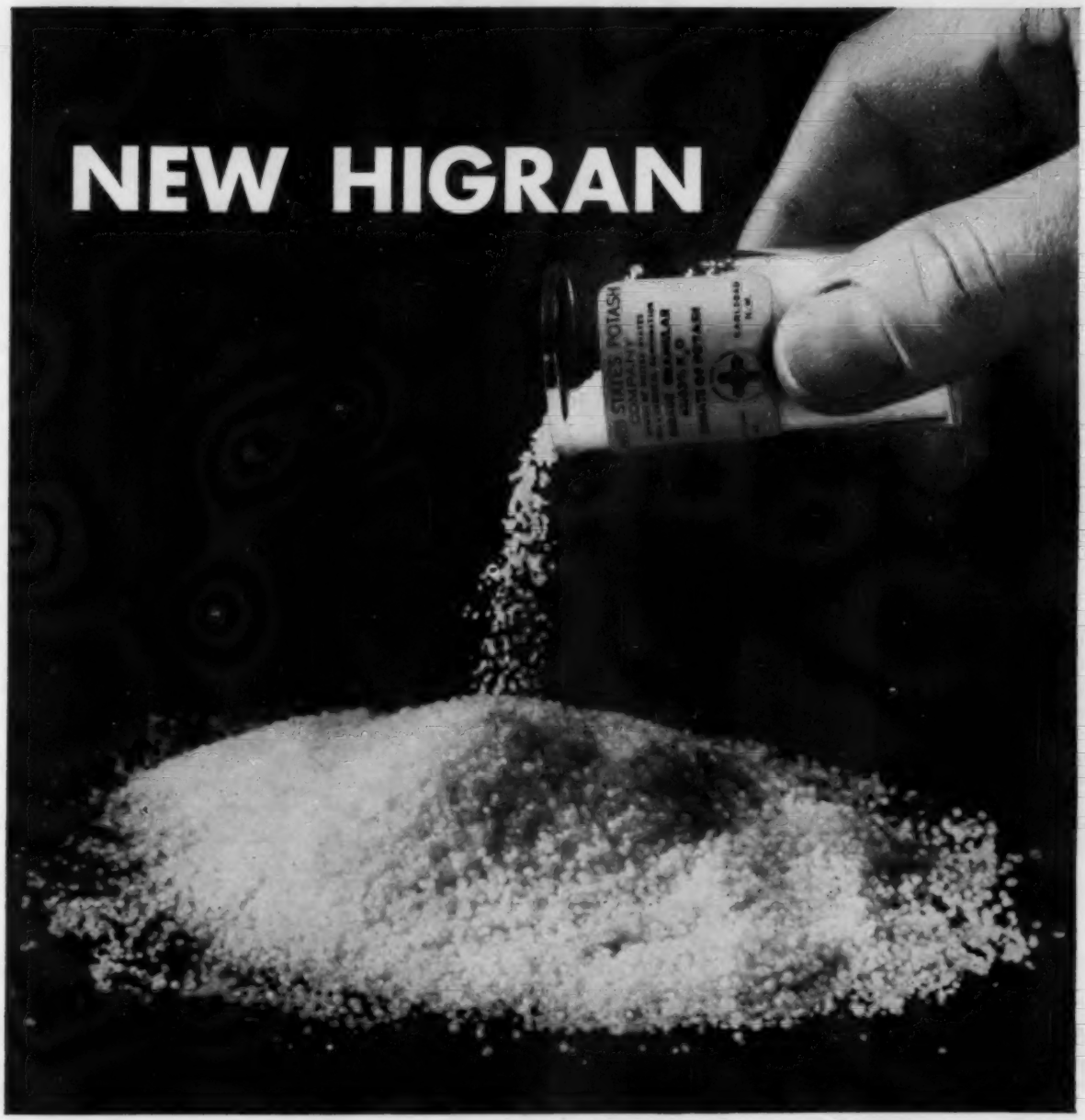

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N. P. F. I. Doubles 56-57 Budget, . . . Adopts Ambitious Program in Move to Expand Fertilizer Market

The membership of the National Plant Food Institute, at its annual business meeting at White Sulphur Springs, W. Va., on June 10, approved a program to intensify efforts of the institute aimed toward expanding the fertilizer market.

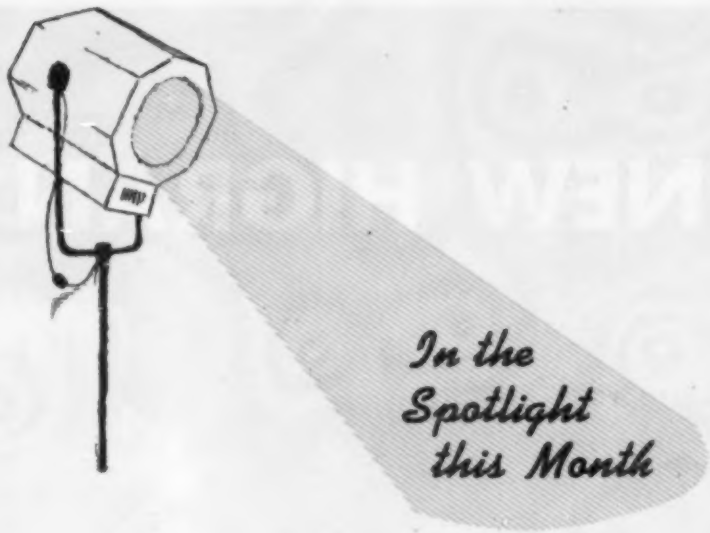
The plan envisions a vastly expanded program by the institute in the fields of research, farm demonstrations, education and promotion which eventually will require a budget approximately double the current level. The first step toward this goal was authorized by the board of directors in their meeting on June 12. This consisted of approval for 1957-58 of a budget roughly one half again as large as the 1956-57 budget together with an increase in dues sufficient to support the higher budget.

To finance the first step in the expanded program, the board authorized an increase in dues on the basic materials as indicated above from 1/20 of 1% to 3/20 of 1% of net sales. Dues for all other plant food materials and mixed fertilizers will remain at the current level of 1/20 of 1% of net sales.

In commenting on the program, newly elected institute president John A. Miller stated, "I feel sure that this move toward a program to expand fertilizer consumption is a wise one. We hope that all present members of the National Plant Food Institute will support it and help in developing the program."

Designed to increase fertilizer consumption in line with recommendations of agricultural authorities, the program contemplates the establishment of four regional offices to permit intensified and continuous work at local levels. Tentatively selected locations for regional offices are Atlanta, Chicago, and San Francisco. The location for the northeastern office is as yet undecided. The goal will be to work out "custom tailored" programs to suit each fertilizer-using area.

"It is our sincere hope," stated Mr. Miller, "that the entire industry will join with us in this important program designed for the mutual benefit of the industry and the American farmer. Most of the nitrogen and phosphate producers have already agreed to support the expanded program at the increased dues rate. A number of the potash companies feel that the dues structure is inequitable as it applies to potash because they, as members of the American Potash Institute, already are paying a substantial amount into that organization. In this connection the board of directors authorized the president to appoint a committee to evaluate the total dues structure of the institute to determine if any inequities exist. Members of the board stated that they would like to see all potash companies continue their membership in the institute for at least a year, pending the study of the dues structure."



- **Fertilizer Use** . . . Total fertilizer consumption for the year ended June 30, 1956 down 533,392 tons to 22,193,070. Page 65.

- **Pesticides on Highways** . . . A report on cost of insecticides and herbicides used along highways and an outline of the recently approved national highway program. Page 38.

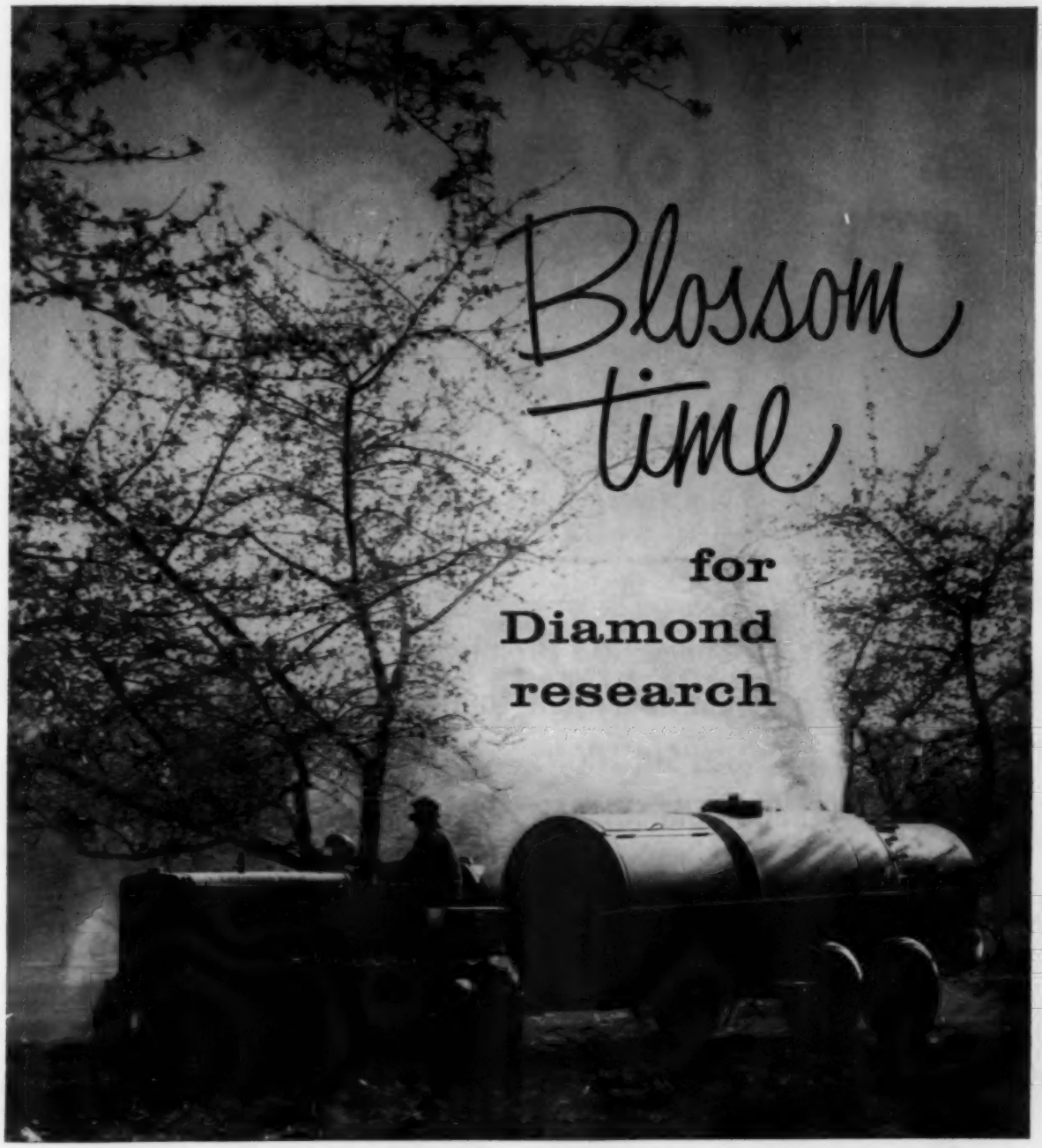
- **Phosphate Plant Nutrients** . . . Part I of a discussion on what happens to the nutrient value of superphosphates in mixed fertilizers when ammoniated. Page 40.

- **Dow ET-57 for Cattle Grubs** . . . Oral doses at an estimated rate of 110 mg/kg of this systemic insecticide show an over all average grub control of 86.9 per cent in a continuation of tests at Kerrville, Texas. Page 45.

- **Wheat Smut Control** . . . Chemical seed treatment is effective against infection by seed borne spores of common bunt, but has no value as a protectant against infection by seed borne spores of dwarf bunt. A discussion of the mode of action of hexachlorobenzene in control of wheat smut in the Pacific Northwest. In two parts. Page 42.

- **Fertilizer Expansion Program** . . . At its annual meeting, NPFI approves a fertilizer expansion program,—discusses how big the fertilizer market is. Page 34.

- **Progress Report on Terraclor** . . . This new fungicide, based on pentachloronitrobenzene, is currently recommended for control of diseases on a number of agricultural crops. It is reported to be particularly effective on species of Rhizoctonia, Sclerotinia, Sclerotium, Streptomyces, Plasmodiophora, and *Tilletia caries*. Page 30.



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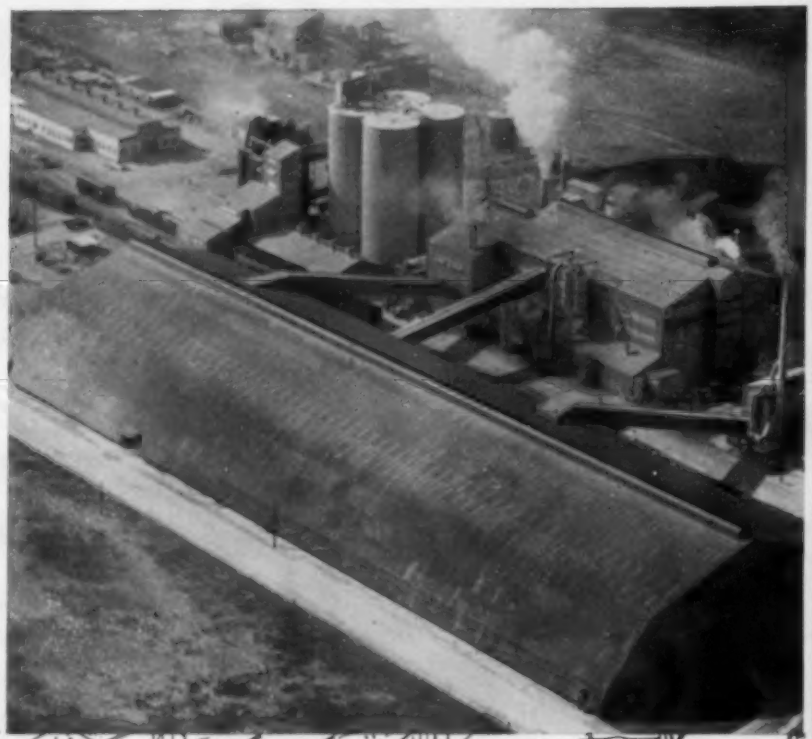

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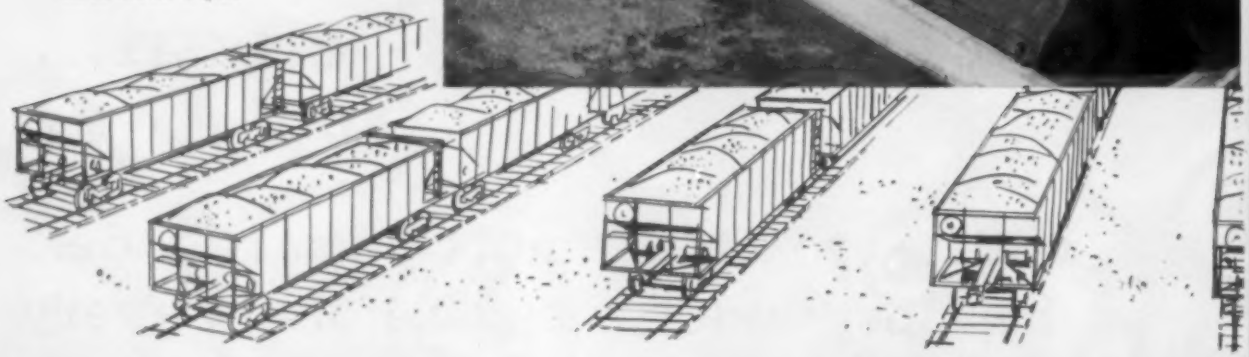

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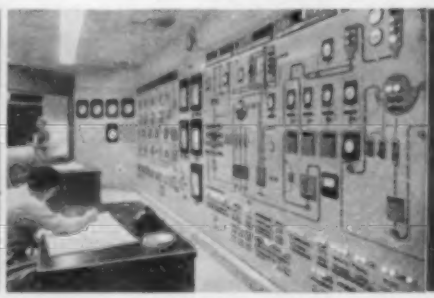

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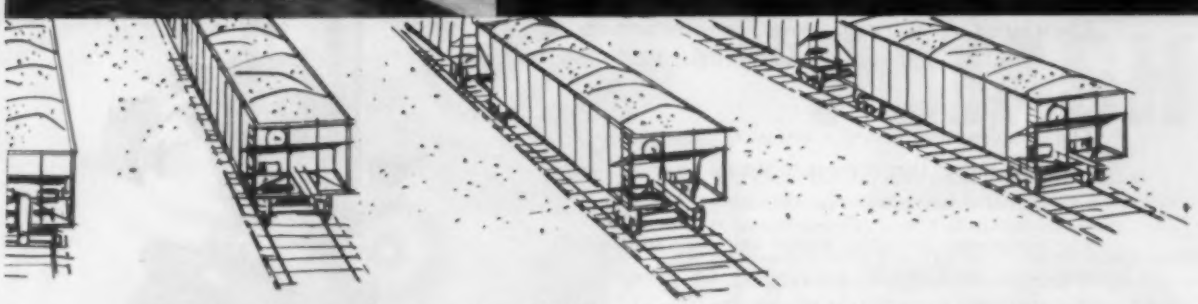

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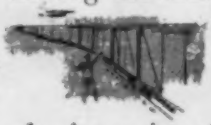
Do a quick buyer survey among the men who last year purchased millions of Chase bags  and you'll hear several good reasons. For instance, the integrity of an industry pioneer that stands behind each order, be it experimental run or multiple-carload. Sound printing techniques that mean accuracy, uniformity, brand appeal . . . as in this Multiwall Paper Bag, for example.

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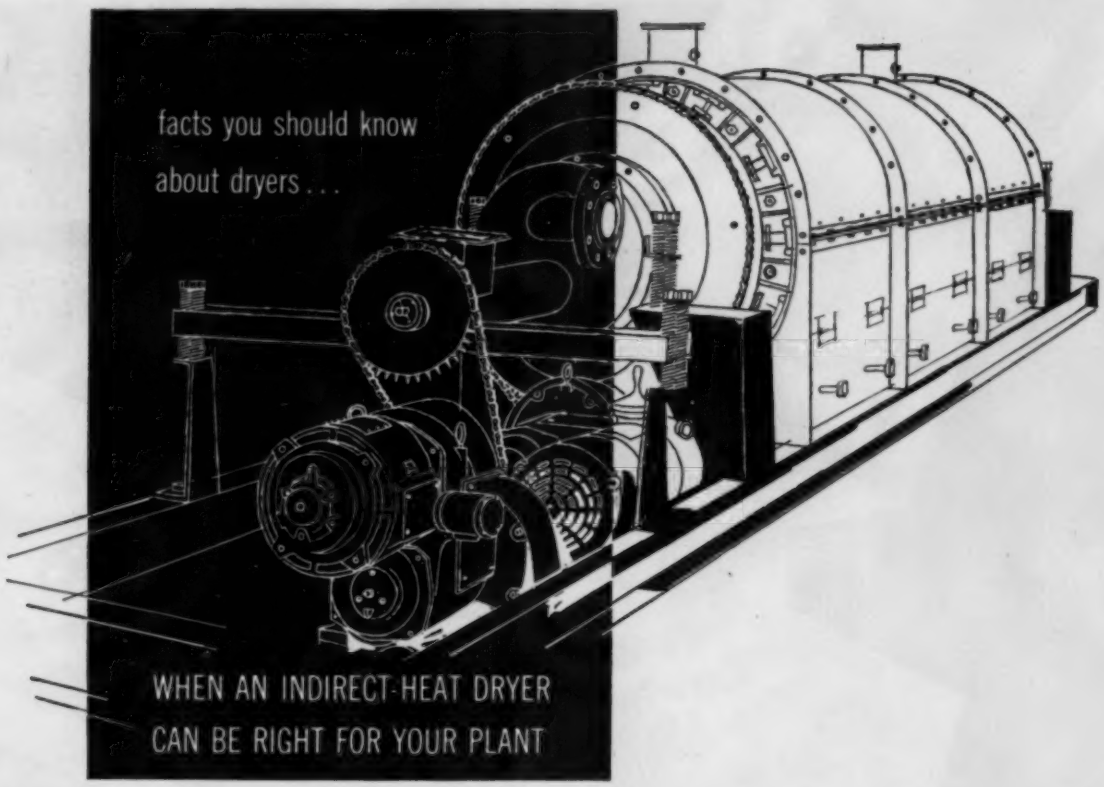

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A. You might consider using a direct-heat rotary dryer that utilizes clean, heated air as the drying medium—air heated by steam coils or a gas or oil fired heat exchanger. However, this introduces a considerable dust collection problem. Besides, from a standpoint of capacity, it is inefficient as well as from a heat-cost standpoint. This makes it unduly expensive. Therefore, a type of indirect-heat rotary dryer is indicated which would greatly reduce both the dust problem and the heat cost.

Q. *What is meant by an indirect-heat rotary dryer?*

A. One in which the material to be dried is warmed by contact with the heated metal surfaces, which in turn are heated by the medium used (usually furnace gases or steam). Those using furnace gases are called "indirect fire dryers". Atmospheric and vacuum drum dryers are examples of steam-heated indirect dryers, but the type in greatest use is the steam tube dryer. This is often referred to as the "Louisville Type" because of the thousands of Louisville Steam Tube Dryers built during the past 55 years.

Q. *How does an indirect-heat dryer minimize the dust problem?*

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Q. *How does this differ from the operation of a direct-heat dryer?*

A. In direct-heat dryers, the hot air furnishes the heat for drying besides removing the evaporated moisture. The amount needed to supply the necessary heat results in a sufficiently high velocity through the dryer to carry out an excessive amount of fine material particles.

Q. *It seems I need an indirect-heat dryer. How can I get competent advice and more information regarding my particular requirements?*

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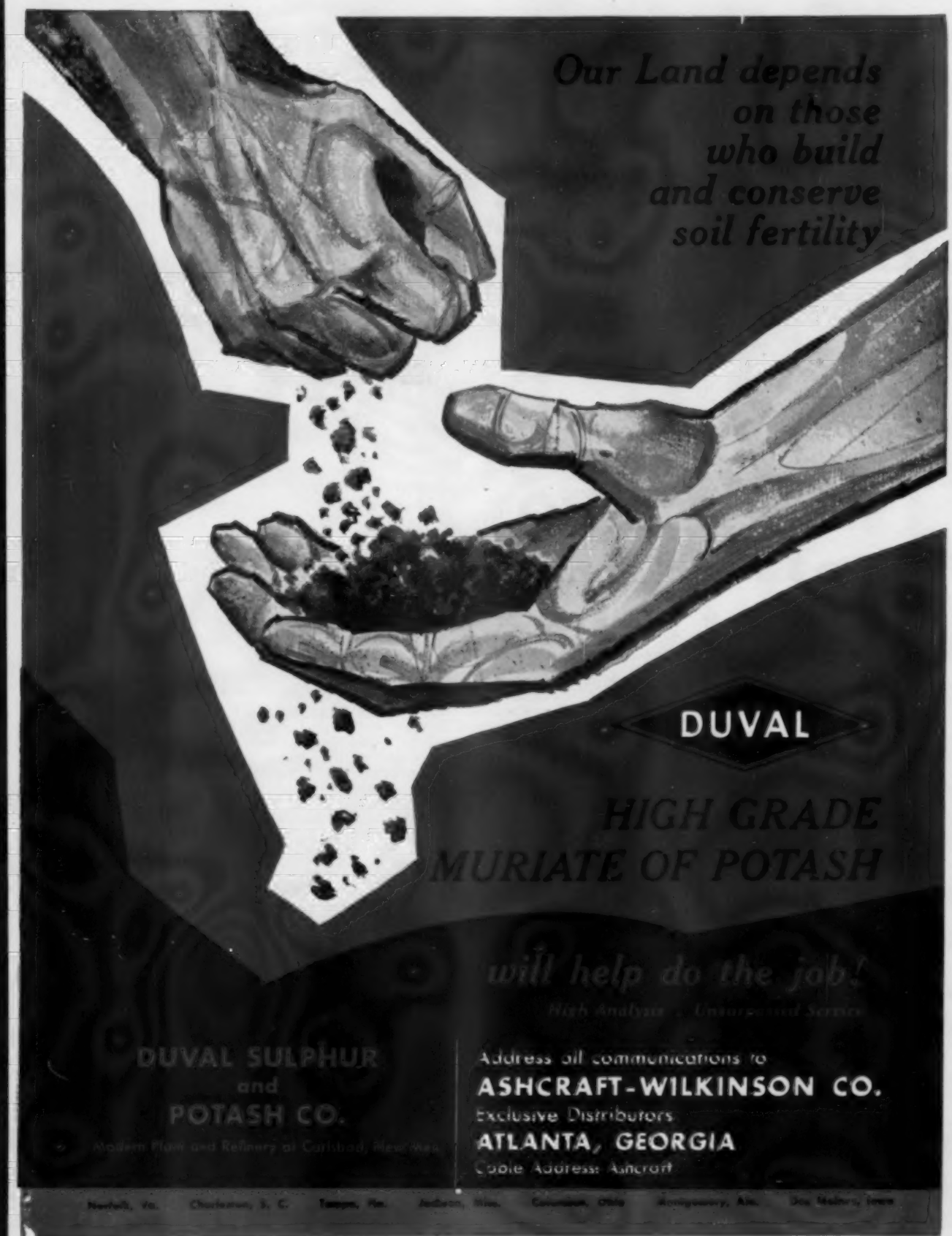
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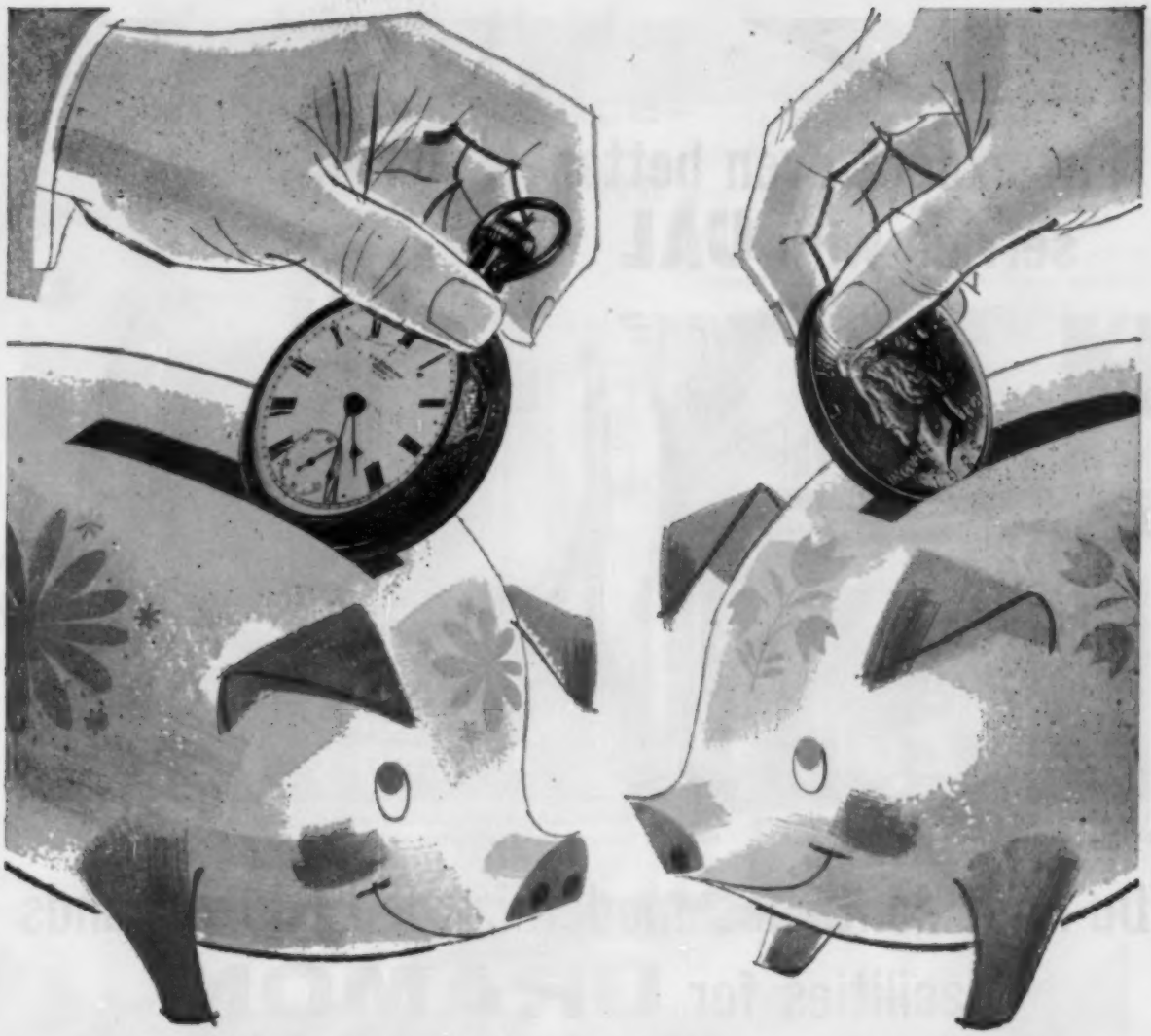

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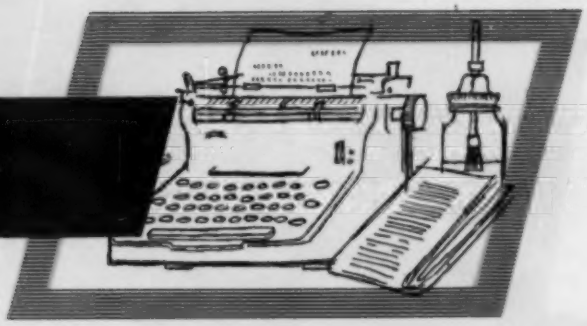
EDITORIALS



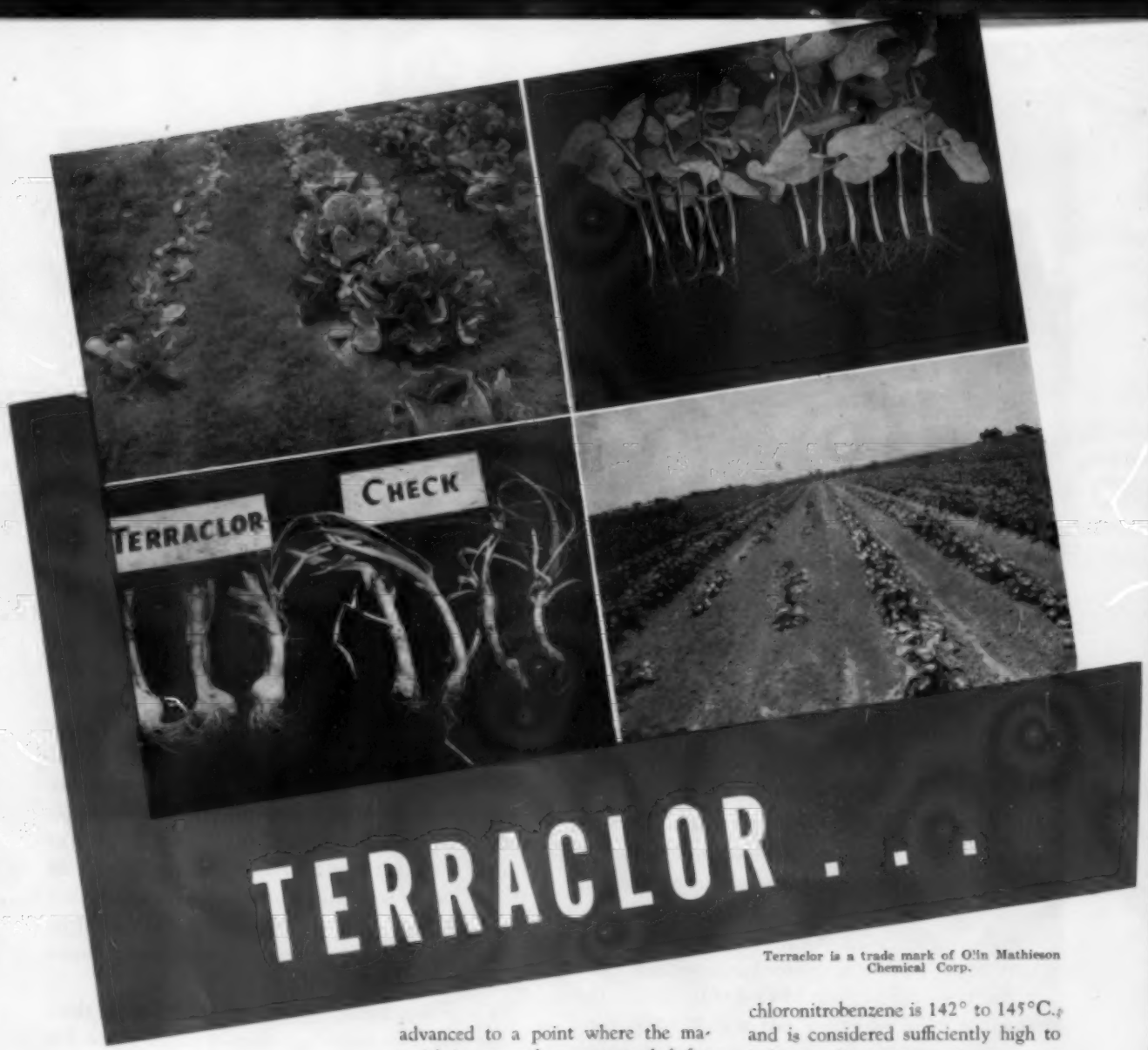
THE annual fertilizer consumption report for the year ending June 30, 1956, just made public by the U. S. Department of Agriculture, reveals that for the third successive year there has been a decline in the volume of fertilizer consumed in the United States. The total effect, over the three year period, has been to reduce fertilizer sales a little over five per cent, although because of the continuing trend toward use of higher analysis products there has actually been a fairly substantial increase in consumption of primary plant nutrients over the three year period.

In themselves these three years of minor declines in fertilizer tonnage are not necesarily serious. American agriculture is still using over 22 billion tons of fertilizer annually. But contrasted with our growing population, and with the steady expansion in fertilizer consumption during the ten year period, 1943-1953, (when the average gain in fertilizer sale was 800,000 tons per year) current consumption figures are definitely indicative of a serious interruption in the long-term steadily rising sales curve. They suggest that, unless the fertilizer industry can reverse the current trend, the fertilizer honeymoon might well be over.

In the light of these figures it would seem to be particularly appropriate that National Plant Food Institute has chosen this time to announce a new program designed to convince the farmer that it will pay him handsomely to use increased quantities of his most efficient productive aid, plant food. The NPFI program is to be built around a three pronged approach: increased research, wider use of demonstrations, and more publicity emphasizing what a good investment fertilizer is. Such a program should be very helpful in turning the fertilizer sales curve back upward, and at the same time helping the fertilizer manufacturers' customer—the farmer—to grow his crops more efficiently.

It is to be regretted that in the course of adoption of the new NPFI program, disagreement has arisen in the organization as to the equitable apportionment of its cost. The disagreement has been so serious that all but one of the major companies in an important segment of the industry have reluctantly decided that they cannot go along with the program for expanded operation, and as a matter of fact are resigning from the association. Such a development is a particular unhappy one since it was only two years ago that the former division in the industry was ended and in a rare exhibition of diplomacy and statesmanship the industry succeeded in joining forces and closing ranks under the NPFI banner.

There is a bigger job to be done today than there was two years ago, and a single voice for the entire industry is more important now than it was then. With this situation facing us, we can't quite bring ourselves to accept the idea that essentially the same individuals who were able to work out a united front for the industry so recently will now be unequal to the task of finding an equitable solution to the controversy that has arisen. We urge those who have the power of decision in the matter to return to negotiation with a determination to work out the problem. And we urge on them the basic approach that no unalterable, hard and fast stands be taken. Compromise is the heart of successful negotiation; there must be give as well as take. We know that the whole industry shares our hope that this disagreement can be adjusted and the industry reunited.



Terraclor is a trade mark of Olin Mathieson Chemical Corp.

CROP losses due to soil borne diseases total millions of dollars each year. Until recently, growers were either unaware of the magnitude of the soil disease problem, or had no completely satisfactory means of controlling these diseases. Terraclor, a new soil fungicide found to be particularly effective against sclerotia-forming fungi, is finding increased use in agricultural applications. Its active ingredient is pentachloronitrobenzene, a chemical which is not new in itself but is relatively new to the fungicide field in the United States. Development work on this chemical in the U. S. was begun by Olin Mathieson Chemical Corp. in 1950, and since then has advanced to a point where the material is currently recommended for the control of diseases (primarily soil-borne diseases) on a number of agricultural crops. The successful application of Terraclor has helped to stimulate development of the soil fungicide field in general. Terraclor is now available for consumer use and can be obtained in dust, wettable powder and emulsifiable formulations. It is easy to use and does not cause skin irritation when handled under normal conditions.

PROPERTIES

Terraclor is completely soluble in ketones and the aromatic and chlorinated hydrocarbons, slightly soluble in alkanols and insoluble in water. The melting point of pentachloronitrobenzene is 142° to 145°C., and is considered sufficiently high to indicate that vapor pressures are negligible at ordinary temperatures. This is reported to be one of the reasons why Terraclor has good stability in the soil. In three-year storage tests, the material stored under normal conditions showed no loss of activity. There was no hydrolysis and no oxidation and it was unaffected by sunlight; volatilization also was not appreciable.

Terraclor has excellent residual action. Field demonstrations indicate that the material retains its activity for as long as 12 months after application. Experimental studies indicate that one application per season is often all that is necessary for satisfactory disease control; tests also show that in certain instances a de-

Top Right: Bean plants on the left show typical Rhizoctonia damping-off. Healthy plants on the right were the result of an in-row application of Terraclor.

Top Left: Cabbage plants on the left are an example of clubroot injury. An application of Terraclor controls clubroot, resulting in normal plant growth, as is shown by the plants on the right.

Bottom Left: Garlic on the left was grown in Terraclor-treated soil in California. Plants on the right are from non-treated check plots and show injury from white rot.

Bottom Right: Skips in cotton rows, as shown on the left, are the result of damping-off. The rows on the right have been treated with Terraclor.

a new soil fungicide

by Carl G. Swingfield
Olin Mathieson Chemical Corp.
Baltimore, Maryland

gree of control has been obtained the following season without applying additional Terraclor. In laboratory studies on residual action at various temperatures, moisture and pH levels, pH had little effect on residual action, some effectiveness was lost at higher temperatures and there appeared to be a trend toward greater loss of residual effectiveness at low moisture levels.

In general, Terraclor is compatible with insecticides and fungicides which have a pH of 7 or below and are similar in formulation. It can readily be combined and applied simultaneously with other pesticides. It is non-corrosive to machinery, is relatively non-poisonous, and does not impart an off-flavor to root crops.

Toxicity

Terraclor is[3] not a highly toxic chemical. Studies conducted at the Medical College of Virginia showed that the acute oral LD_{50} to rats when pentachloronitrobenzene is administered as an aqueous suspension of a wettable powder is greater than 12 grams per kilogram. By comparison, the LD_{50} for DDT is 0.25 grams per kilogram (250 mg/kg), making it approximately 50 times more toxic than Terraclor. When technical pentachloronitrobenzene was administered as a 10% corn oil solution, the LD_{50} for male rats was 1.71 ± 0.20 and for females 1.65 ± 0.17 grams per kilogram. In subacute toxicity studies, rats were fed for three months at levels ranging between 0 and 5000 ppm, and adverse effects on survival occurred only at the 5000 ppm level. Growth was depressed at the 5000 ppm level in both sexes and at 2500 ppm in male rats.

In the chronic toxicity studies, rats were fed pentachloronitrobenzene at dietary levels between 0 and 2500 ppm for a two year period. No adverse effect on survival was apparent. Among female rats a tendency toward growth depression was noted at levels of 100 ppm and higher, but was not consistent with increased dietary concentration. Among male rats, depressed growth was observed only at the 2500 ppm diet. Pentachloronitrobenzene was added to the diets of dogs for a one year period at levels of 25, 200 and 1000 ppm. No adverse survival, growth or hematological effects were observed.

Residues

Residue analyses have thus far been conducted on 11 crops of economic importance. At recommended rates of application, the data indicate that residues are well below the 0.1 ppm level and are considered insignificant on harvested crops. For all intent and purposes this is considered as no residue, and label registration has been granted on this basis.

Use

In the course of field development, Terraclor was found to be a particularly effective fungicide for controlling species of Rhizoctonia, Sclerotinia, Sclerotium, Streptomyces, Plasmodiophora, Botrytis and also *Tilletia caries*. It was also noted that Terraclor does not effectively control Fusarium, Pythium, Verticillium, Phytophthora, Thielaviopsis and Aphanomyces. Of the above fungi, Terraclor is perhaps more specific for Rhizoctonia than any of the other soil-borne diseases, and effective control can be obtained in the field with very low concentrations.

Terraclor is now registered for use on six types of crops: clovers and alfalfa, cotton, vegetables, peanuts, wheat and ornamentals. For these groups of crops, six important pathogenic fungi are controlled by the use of Terraclor.

In clovers and alfalfa, crown rot (*Sclerotinia trifoliorum*) is effectively controlled by the application of 9 to 11 pounds active Terraclor per acre as a spray or dust. Best results have been obtained when application has been made in late fall, but application may be made also when the first signs of disease are apparent in late winter or early spring. Control of this

[3]The writer wishes to acknowledge the work of C. K. Cloninger, A. M. Hillis, R. J. Jefferson, F. R. Johnson, and R. L. Thornton (Olin Mathieson Chemical Corporation) in the development of Terraclor. Their time, efforts and talent were responsible for advances in the soil fungicides field which made the writing of this article possible.

disease can result in a significant increase in both forage and seed yields.

Damping-off (*Rhizoctonia solani*) of cotton in the South has been a major factor in preventing a vigorous uniform stand of cotton when it is planted early in the spring. Where Rhizoctonia is the only problem, an application of 4 to 5 pounds active Terraclor per acre to the seed and surrounding soil at planting time reduces the possibility of having to replant. In more recent years, it has been discovered that in many areas a soil disease complex is responsible for cotton seedling damping-off. Pythium and Fusarium, in addition to Rhizoctonia, may also be responsible for seedling losses. Since Terraclor is not an effective chemical for either Fusarium or Pythium, a combination of fungicidal chemicals must be utilized to aid in control. Since fungicides are somewhat specific, the more recent trend is toward the use of fungicide combinations on cotton.

In the vegetable industry, damping-off (*Rhizoctonia solani*) is a problem in the production of beans. It can be controlled by the application of 3 to 4 pounds active Terraclor per acre sprayed or dusted in a 6 to 12-inch band over the seed and surrounding soil at planting time. Where a soil disease complex exists, fungicide combinations are suggested similar to that for cotton.

Terraclor is responsible for a many-fold increase in production of some crops. Crucifer fields which are infected with clubroot (*Plasmodiophora brassicae*) may go out of production without a means of control. The application of Terraclor can provide this control and may increase the per acre yield as much as 3 to 5 tons. Twenty to forty pounds active per acre in the row, 30 to 60 pounds active per acre broadcast, or a transplant solution containing 2 to 6 pounds Terraclor 75% wettable powder per 100 gals. and applying ½ to ¾ pint per plant will provide the desired control. While row and broadcast applications have been effective, experience at Olin-Mathieson indicates that the most effective means of controlling clubroot is by the transplant method. Wirestem or black root (*Rhizoctonia solani*) of crucifers can also be controlled effectively by applying Terraclor in an 8-inch band centered on the row immediately prior to seeding, at the rate of 50 pounds active per acre (1.2 pounds active per 1000 square feet), and rototilling to a 2-inch depth. Where drench type applications are desired, a row drench may be used, applying 10 to 15 pounds Terraclor 75% wettable powder per acre, or a broadcast drench applying 15 to 20 pounds Terraclor 75% wettable powder per acre.

In California, Terraclor has been a big boon to the garlic industry. White rot (*Sclerotium cepivorum*) can reduce yields as much as 50% in fields with heavily infested soils. White rot is controlled effectively by applying 20 pounds active per acre as a spray in the row or by treating cloves prior to seeding with 10 pounds active Terraclor per 1000 pounds of "seed" cloves.

In lettuce production, two diseases can be controlled effectively by applications of Terraclor. For Sclerotinia drop (*Sclerotinia sclerotiorum*), an application of 15 to 20 pounds active per acre should be made. As a dust or spray in 150 to 200 gallons of water, it should be applied in a band 6 to 12 inches wide centered on the row when the plants are 2 to 3 inches high and have been thinned. For the control of bottom rot (*Rhizoctonia solani*), two applications should be made, each consisting of four pounds active per acre in a band 6 to 12 inches wide centered on the row. The first treatment should be applied only when the plants are 2 to 3 inches high, and the second treatment 10 days following.

Several diseases which have plagued potato growers for many years are scab (*Streptomyces scabies*) and Rhizoctonia. These diseases can now be controlled effectively with Terraclor by applying 35 to 65 pounds active per acre in the row using suitable application equipment, or by applying 105 to 195 pounds active per acre broadcast and disking and cross-disking to a depth of 4 to 6 inches. More recent experimental work is giving indications that lower rates can possibly be used. This is particularly true for Rhizoctonia control. At sev-

Lettuce plants on the left show damage due to bottom rot. Plants on the right were grown in adjacent plots treated with Terraclor.

Tomatoes on left have been damaged by southern blight. Those on the right were grown in soil treated with Terraclor.

eral locations, Rhizoctonia has been controlled effectively with rates as low as 20 pounds active Terraclor per acre broadcast, or 10 pounds active applied in the row. Recommendations still remain at the higher rates, however, pending receipt of additional data on low rates of application.

Peppers and tomatoes have recently been added to the list of vegetables on which Terraclor can be used. Southern blight caused by *Sclerotium rolfsii* attacks these crops in many areas but can now be controlled by applying Terraclor by means of transplant water. Until now, no economical chemical control existed for the southern blight disease. Very effective control is obtained when 3 to 5 pounds of Terraclor 75% wettable powder is mixed in 100 gallons of water, and a ½ pint of this solution is applied per plant at the time of transplanting. Where a transplant solution is not desired, control may be accomplished by the application of a dust or spray at the rate of 7½ pounds active per acre over an open "V" trench just before setting transplants. The plants are then set in the bottom of the trench and the treated walls of the trench are pressed against the stems of the young transplants.

Sclerotium rolfsii or southern blight is also a factor in peanut production. While this disease may appear in the plants any time during the growing season, it does the most damage in late summer or early fall as plants approach maturity. Control of this disease can result in increased yields of clean peanuts. Several types of Terraclor applications can be used. As a surface band treatment, 12 to 15 pounds active per acre can be applied in a 12-inch band centered on the row at pegging time. In many areas in the Southeast, landplaster is added as a soil amendment at approximately the same time. Therefore, where cultural practices permit, Terraclor may be mixed with and applied simultaneous with landplaster. As a preplant soil mix application, apply 15 to 20 pounds active per acre in an 8 to 12-inch band centered on the row and mixed to a depth of 2 to 4 inches. If application is desired at the time of cultivation, Terraclor may be applied in split applications during three cultivations at the rate of six pounds active per acre per application. Dust or spray nozzles should be attached, one on each side of inside cultivator sweeps, and adjusted so as to treat a band 12 inches wide, centered on the row.

Terraclor is also an effective chemical for controlling stinking smut or bunt (*Tilletia caries*) of wheat. Excellent results have been obtained in trials in the Pacific Northwest and on the basis of this and other work, recommendations for dry treatment are to apply the 75% wettable powder at the rate of one ounce per bushel of seed. If desired, slurry treatments may be made. One of the factors that make Terraclor such an important seed treatment material for wheat is that it is effective not only against seed-borne smut, but against soil-borne smut as well. It has the added advantage of being relatively non-toxic.

In the ornamental field, growers are getting a many-fold return on their investment by using Terraclor. Crown rot (*Sclerotium delphinii*) and black rot of bulbous iris can be controlled by applying ½ pound active Terraclor per 100 square feet. For Sclerotinia stem rot (*Sclerotinia sclerotiorum*) of larkspur, calendula, sweetpeas and snapdragon, 1/5 pound active Terraclor should be applied per 100 square feet. To control Sclerotinia flower blight of camellia, ½ pound per 100 square feet is recommended. For stem rot due to *Rhizoctonia solani* on various ornamentals such as carnations, African violets, poinsettias, snapdragons, effective control can be obtained by applying as a dust two pounds 75% wettable powder Terraclor per 1000 square feet and mixing into the soil. Drench applications may be made if preferred.

Application Methods

THE correct application of Terraclor is an important factor in obtaining effective control. Generally speaking, the following types of application are used: 1) soil mix, 2) surface, 3) transplant solution and 4) seed treatment. Soil mix is used most frequently, and can be accomplished by broadcasting Terraclor with suitable equipment, and then disking and cross-disking to the desired depth or by applying Terraclor in the row using suitable application equipment. In-row soil mix is often desired and is also more economical. However, the development of equipment has been a stumbling block in the rapid commercial acceptance of this type of application. Equipment is being developed for this method of application by the Howry-Berg Steel and Iron Works and is currently under observation. With this equipment, we believe the in-row application problem will be minimized in the future.

Soil mix application for such crops as cotton and beans is accomplished by spraying or dusting over the seed and surrounding soil as the seed is planted, using standard equipment which can be adapted to this application. A recent development in dust equipment by the Gustafson Manufacturing Company should insure better distribution of the chemical in the soil than has been accomplished in the past.

Thorough mixing of the chemical in the soil is very important in obtaining maximum effectiveness. The seed or plant bed should be well prepared and the chemical mixed evenly in the soil in the zone needed for plant protection. Where mixing is accomplished by rototilling, the operation should be observed closely so as to prevent such examples of poor mixing as "inverting" or "turning over" the chemical.

The other types of application, of course, have been in practice for some time and are not, in themselves, unique.

These are the most significant advances to date in the use of Terraclor as a soil fungicide. Additional work is being conducted on other crops. Greatest promise of new application in the immediate future appears to lie in the control of certain diseases affecting strawberries and mushrooms, and in controlling additional other diseases of tomatoes, beans and ornamentals.★★

NPFI Approves Expanded

Fertilizer Market Program

"THE Fertilizer Market is Big!" acclaimed speakers representing the banker, farmer, researcher and economist, at the National Plant Food Institute meeting held June 9-12 at the Greenbrier Hotel, White Sulphur Springs, W. Va. How big is the fertilizer market? . . . just Big . . . its potential has not yet been recognized nor realized, but its credit is sound. On the other hand, consumption figures for the past three years have shown a slight decline and members of the NPFI agreed a program for expanding the fertilizer market is needed.

At the annual business meeting, NPFI members approved such a program which was outlined by Russell Coleman, executive vice president of the Institute, and which will involve setting up four new regional Institute offices in the Mid-West, Far-West, Southeast and Northeast. As presented, the program would double the previous budget. Although all members endorsed the object and organization of the proposed program, six of the seven potash companies objected strongly to the proposed plan for assessment of costs, and threatened to resign if the membership approved the resolution as presented.

The potash companies opposing the financial assessments, who incidentally are all members of the American Potash Institute are: Potash Co. of America; American Potash and Chemical Corp.; Duval Sulphur and Potash Co.; National Potash Co.; Southwest Potash Corp. and U. S. Potash Division of U. S. Borax and Chemical Corp. G. F. Coope, president of Potash Company of America, acting as spokesman for the potash producers opposing the resolution explained that his company and other

(*Continued on Page* 36)

(1) E. Kapusta, U. S. Potash Co.; R. Heuerman, IMCC; E. W. Harvey, Nitrogen Division; W. T. Dible, IMCC; and W. Caspari, Davison Div., W. R. Grace.
(2) G. W. Sugga, Nitrogen Division, Allied Chemical; C. T. Marshall, Commercial Solvents Corp.; J. Totman, Summers Fertilizer Co.; L. Gopp, IMCC; and Dugan Taylor, Grand River Chemical Div.
(3) H. B. Mann, American Potash Institute; J. Devlin and T. W. Childs, Southwest Potash Corp.; and E. N. Carvel, Valliant Fertilizer Co.
(4) R. C. Wells, W. B. Porterfield, F. C. Broadway and S. H. Rogers, all of National Potash Co. Front row: Mrs. Porterfield and Mrs. R. C. Wells.
(5) R. B. Lenhart, Potash Co. of America, W. F. Jacobi, Union Bag Co.; E. Phillips, GLF; J. C. Crissey, GLF; and L. Kaniecki, Tennessee Corp.
(6) A. Spillman, Fertilizer Manufacturing Coop.; Mercer Rowe, Ashcraft Wilkinson; G. B. Morris and O. P. Bernhardt, Cooperative Fertilizer Service.
(7) Vincent Sauchelli, NPFI; J. H. Daugtridge, du Pont; W. Hewitt, Pacific Guano Co.; H. S. Ten Eyck, and Ronald P. Stanton, International Ore.
(8) K. Ludington, Chase Bag; C. J. Ball, and A. B. Baker, Bradley & Baker; and C. C. Arledge, Virginia Carolina Chem.
(9) Angus Taylor, Chem. and Ind. Corp.; Ward J. Jackson, Commercial Solvents Corp.; Mrs. S. T. Ellis; R. V. Haslanger, Escambia Chem. Corp.; Mrs Haslanger; S. T. Ellis, Commercial Solvents Corp.; and Mrs. Jackson.

The amendment to the by laws approved by the NPFI membership places a new maximum dues rate of 1/5 of 1% of net sales on nitrogen, phosphate rock, superphosphates, potash and sulfur produced or imported and sold as such for plant food use in the U. S. The maximum dues rate for mixed fertilizer and other fertilizer materials was left unchanged.

To finance the first step in the market program, the NPFI board authorized an increase in dues on the basic materials as indicated above from 1/20 of 1% to 3/20 of 1% of net sales.

The board urged potash producers to continue their membership in the Institute for at least a year, pending study of the dues structure.

(See Pg. 8 for detailed statement.)

Statement by G. F. Coope

"Mr. Chairman, in voting against this proposal, I want to make it very clear that I am not voting against the basic program to encourage use of fertilizer—that I heartily endorse. What I am voting against is the distribution of costs. In the first place, the expanded program proposed is designed to help all of us equally and yet the total financial burden is placed solely on the producers of primary plant foods—and the captive tonnage of the primary producers is exempt.

"This apportionment of cost is extremely inequitable for the potash producers, or to be more exact, for that great majority of the potash companies who have for years supported the American Potash Institute . . . for a program of research, education and promotion which benefits the entire fertilizer industry. This assessment is six times as high as the maximum rate proposed by the NPFI. The Potash Institute program is substantially the same as that now proposed by the Plant Food Institute and is constantly growing in size, cost and effectiveness.

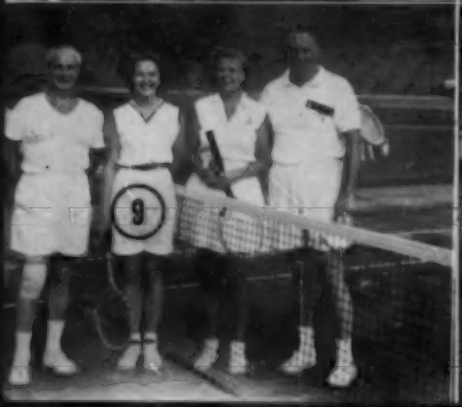
"In fact, it is of a magnitude comparable to that of the first year of the program now contemplated by the National Plant Food Institute and costs the Potash Institute members more per year than is currently expended by the National Plant Food Institute on all of its activities. Because this Potash Institute program exists, the Plant Food Institute program will be that much easier and cheaper; but, I repeat, that the present Potash Institute program is financed by the member potash companies alone.

"When my company was told of the current proposal, we studied it with care and concluded that the basic objective was commendable. However, as we were already deeply committed to the heavy expense of the Potash Institute, we concluded we could not bear the additional burden of this program as presented to us. I understand the other potash companies similarly affected felt the same.

"In a meeting between the members of the special committee of the Plant Food Institute, and the representatives of the domestic potash producers, the points which have been covered in the foregoing remarks were advanced. Because we favored the basic program, my company even offered to double our present contributions to the Plant Food Institute, but this did not meet the requirements of the current proposal. Other potash producers facing the same dilemma also offered a similar increase in contributions. No reply was made to our arguments, our offer and the statement of our position.

"In summary, my company's position is simply that we cannot accept the inequitable allocation of costs of this proposal and, if it is adopted, my company intends to submit its resignation from the Plant Food Institute. I am told that other major potash producers, with the exception of one which does not contribute to the American Potash Institute, are of the

(*Continued on Page* 104)



potash producers approve completely of the program proposed, but object to the plan for assessment of costs on the grounds that it is inequitable.

He pointed out that the Potash group, as members of the American Potash Institute, are already financing a similar market expansion program, and feel they would be assessed excessively in being asked to finance another program, as compared with costs to nitrogen and phosphate producers. The complete text of Mr. Coope's statement appears on p. 35.

In the discussion concerning the proposed resolution, Louis Ware, president of International Minerals and Chemicals Corp., (not a member of the American Potash Institute), was the sole potash producer belonging to the NPFI to give his full support to the program as presented. The membership finally voted to approve the market expansion program, without reference to distribution of assessment costs, and to amend the bylaws of the constitution to permit the board of directors to determine the final assessment. The NPFI board

(1) T. A. Mitchell, J. E. Murray, Leon Kaniecki, and G. K. Walter, all of Tennessee Corp.

(2) Sam Nevins, Olin Mathieson Chemical Corp.; and W. E. Weems, American Cyanamid Co.

(3) Mrs. J. C. Denton, Harold E. Bingham, Spencer Chemical Co.; Mrs. S. Wright and S. Wright, Texas Farm Products; and Mrs. Herold Bingham.

(4) Russell Coleman, executive vice chairman, NPFI, and Hugo Riemer, Nitrogen Division, Allied Chemical & Dye Corp.

(5) W. C. Stark, Atlantic Fertilizer Corp.; Mr. and Mrs. W. E. Merritt, H. J. Baker & Bros.

(6) Mrs. Eugene German, Duval Sulphur and Potash Co. and Marion Nabors, Ashcraft Wilkinson Co.

(7) C. S. Schmelzer, Smith Agricultural Chemical; A. H. Carnes, Central States Fertilizer Co.; G. Van Deren, Blue Grass Plant Foods; Vincent Rebak, Grace Chemical Co.; Dean Gidney, U. S. Potash Co.; and A. G. Grady, Sinclair Chemicals, Inc.

(8) G. F. Coope and John Hall, Potash Company of America.

(9) George Burns of Chase Bag, Alice Morgan, Mrs. & Mrs. Robert Hector, Hector Supply Co.

(10) J. S. Whittington, Olin Mathieson Chemical Corp. & A. A. Schultz, Reading Bone Fertilizer Co.

(Left to Right) Mrs. Gene Van Deren; Mr. and Mrs. Frank Kennedy, Potash Company of America.

Roy Bossolt, H. Wicks, and O. W. Terhune, The Terre Co.

J. C. Engibous, IMCC; Mr. and Mrs. James O'Donnell, Nitro-Form Agricultural Chemical Co.

appointed a committee to study the problem.

The Expansion Program

THE market expansion program described by Mr. Coleman is designed (1) to increase fertilizer use through farm demonstration programs in cooperation with state and federal agencies; (2) to develop more specific informational programs based on the results from research and demonstrational projects; and (3) to broaden and strengthen fertilizer research through increased grants to universities and colleges.

In outlining the expansion program, Dr. Coleman pointed out that under the present organization, NPFI is limited in the extent of its contact with other sections of the country, in the far west, southeast, midwest. . . . That a closer liaison with farmers etc., is essential, and that regional Institute offices will permit such cooperation.

"Efficient use of fertilizer is one of the best ways farmers can reduce the per unit cost of production, and the expansion program will enable us to focus greater attention on the plant food needs of farmers, all in keeping with the recommendations of the agricultural colleges."

How Big is the Market?

"THE American farmer can buy every pound of plant food in the next five years that the industry is able to sell him," advised O. E. Anderson, Ohio Bankers Association. Mr. Anderson referred to the financial ability of the farmer to buy fertilizer, and quoted a statement in the USDA *Agricultural Finance Review*, which asserts that "the farmers of this nation are financially capable of tackling any project in which they are interested. As a whole, they could double their use of plant food. Yes, credit-wise, they could triple their use of fertilizer."

Mr. Anderson indicated that the total assets of American farmers at the beginning of this year stood at $170,100,000,000, as compared with total liabilities amounting to only $18,800,000,000. "Those assets of $170 billion are the highest on record in the U. S. history of agriculture.

He concluded his remarks by observing that "we have a reluctant customer, but he is a customer with a terrific potential. I for one, believe he can be persuaded to enter the market."

Giving a farmer's views on the fertilizer market, Wilbur Renk, Sun Prairie, Wisconsin farmer observed that "As our population increases, there will be an increased use of fertilizer . . . but it will all be tied up to our farming economy. A hard-up farmer is not a generous buyer of fertilizer. So I believe you are just as interested as I am in the economic welfare of the farmer. Fertilizer helps us produce more and more economically. But let us realize that we need to find new uses for crops as well as packages to better merchandise farm products."

Looking to the future, Mr. Renk noted that corn is one of the farmer's most profitable crops, and greater use of this crop would naturally be to his advantage. Changing food patterns in the country of course affect the farmer's income to a sizeable extent. He said that if farm prices can be increased, we (the farmer) can double your fertilizer market. The average farmer is old fashioned, concluded Mr. Renk. He doesn't like to buy something he can't pay for.

(*Continued on Page* 104)

Walter J. Sackett, Jr., A. J. Sackett & Sons; L. B. Hein, Olin Mathieson Chemical Corp.; and J. L. Prosser, A. J. Sackett & Sons.

Some of the players in the NPFI tennis tournament; Mr. and Mrs. W. M. Clines, American Potash & Chemical Corp.; and Russell White, Stauffer Chemical Co.

Pesticide Use

Table I. Cost of Herbicides Used Along Highways In 1955

State *	Miles of Road in State System	Total Cost of Herbicides Used in 1955	Type ** of Herbicide Used
Alabama	16,286	None	
Arizona	3,975	$15,000	
California	14,000	88,675	sodium borate-chlorate
Colorado	15,693	12,510	sodium borate-chlorate
Connecticut	3,000	30,200	2,4-D, 2,4,5-T Sodium dichloropropionate
Delaware	3,997	None	
Florida	12,950	5,550	monuron
Iowa	9,686	21,376	2,4-D, 2,4,5-T
Idaho	4,708	22,775	2,4-D, 2,4,5-T
Illinois	12,954	34,500	2,4-D, 2,4,5-T
Kansas	10,730	47,902	2,4-D, sodium chlorate
Kentucky	18,821	7,665	sodium dichloropropionate ammonium sulfamate
Louisiana	15,146	19,000	ammonium sulfamate, TCA
Maine	13,833	3,200	ammonium sulfamate, 2,4-D, 2,4,5-T
Maryland	4,625	None	
Massachusetts	7,606	25,700	2,4-D, 2,4,5-T
Michigan	103,085	24,717	2,4-D, 2,4,5-T
Minnesota	24,481	25,276	2,4-D, 2,4,5-T
Mississippi	15,953	None	
Missouri	22,505	40,143	2,4-D, 2,4,5-T, TCA
Montana	19,838	11,400	2,4-D, 2,4,5-T sodium chlorate
Nebraska	18,572	7,793	2,4-D, 2,4,5-T sodium chlorate
Nevada	3,909	None	
New Hampshire	4,026	675	2,4-D, 2,4,5-T
New Jersey	4,005	2,000	2,4-D, 2,4,5-T
New Mexico	18,748	599	monuron
New York	12,964	5,000-7,500	2,4-D, 2,4,5-T, sodium dichloropropionate, monuron
North Carolina	89,901	Under 1,000	
North Dakota	6,606	None	
Ohio	27,935	73,332	2,4-D, 2,4,5-T
Oklahoma	20,714	None	
Oregon	7,427	37,176	2,4-D, 2,4,5-T, sodium borate-chlorate
Pennsylvania	41,207	13,075	2,4-D, 2,4,5-T
Rhode Island	956	1,148	2,4-D, 2,4,5-T ammonium sulfamate
South Carolina	24,228	None	
South Dakota	6,310	18,186	2,4-D, sodium borate, monuron
Tennessee	14,787	None	
Texas	52,000	None	
Virginia	49,931	21,527	2,4-D, 2,4,5-T, sodium dichloropropionate
Washington	5,785	2,500-5,000	2,4-D, 2,4,5-T, monuron
West Virginia	31,299	None	
Wisconsin	22,630	3,721	2,4-D, 2,4,5-T
Wyoming	4,945	None	
TOTAL	820,757	$628,320	

* No reports received from Arkansas, Georgia, Indiana, Utah, Vermont.

** Chemicals used in minor quantities in each state are not listed. Cost of chemical does not include application costs.

THE National Highway Program, recently approved, represents the largest peacetime construction program in history. The 41,000 mile network of interstate highways will be built on an average 300 foot right of way and will place over one million acres of land along the pavement subject to landscaping and maintenance.

The Committee on Roadside Construction and Maintenance surveyed the states to secure information on the present use of pesticides. The type and cost of herbicides are summarized in Table I.

The use of herbicides saves from one to two mowings per year, by eliminating weeds such as plantain, wild carrot, and ragweed from the maintained area.

The following total mowing costs for 1955 were reported: Mississippi — $679,916, Nebraska — $500,000, South Dakota—$488,544.

The highway is normally maintained for a distance of ten feet from the pavement on each side of the road, or equivalent to 2.5 acres per mile.

The 820,757 miles (Table I) represents 2,051,892 acres. Approximately 60,000 miles or 7.3% of this mileage was treated one or more times with herbicides in 1955 at a chemical cost of $628,320.

The potential savings through use of herbicides may be illustrated by some cost analyses furnished by the State of Ohio. They reported a cost of $126.62 per mile per season for mowing areas not sprayed with 2,4-D and a cost of $108.17 per mile for both mowing and cost of chemical treatment, for a savings of $18.45 per mile by use of an herbicide.

on Highway Areas

by J. W. Zukel*
and C. O. Eddy**

Insecticides were applied to approximately 17,000 miles, which is equivalent to 2.0 per cent of the total mileage treated one or more times with insecticides.

The use of DDT to control the vector of Dutch Elm disease is cheaper than the average cost of $80 to remove a diseased Elm tree, according to costs for the Connecticut Highway Department.

The use of 2000 pounds of chlordane in Connecticut and less than $1000 worth of lead arsenate in New Jersey represents the total expenditure for control of soil insects on over two million acres of maintained turf.

Use of fungicides and seed treatment chemicals by the states was also covered in the survey.

None of the 43 states responding to the survey reported any use of seed treatment by the highway department. Kansas was the only state that reported use of some bordeaux and ferbam on a spot treatment basis. All other states did not use any fungicides, either on the turf or roadside plantings over the 820,757 miles (equivalent to 2,051,892 acres) of highway area under maintenance.

The regular Federal Aid program, administered by the Bureau of Public Roads, which is distinct from the new Federal Aid Highway Bill, allocates 2½ billion dollars per year to the states. A provision in this program provides 1½ per cent of this fund on a yearly basis for research on highway problems. This research fund has, in the past, been used primarily for physical research on highway materials. There is a recent trend to the use of these funds for research which might include evaluation of chemicals to reduce maintenance costs. Such research projects are initiated through the materials or research engineer of each state highway department.★★

Table III. Cost of Insecticides Used Along Highways in 1955

State	Insecticides Used	Insects Controlled	Total Cost of Insecticides **
California			$ 2,500-5,000
Colorado			Less than $1000
Connecticut	Chlordane DDT Aramite	Elm bark beetle Elm leaf beetle cankerworms Japanese beetle	17,200
Delaware	DDT, BHC	mosquitoes	17,980
Iowa	dieldrin	grasshoppers	250
Illinois	toxaphene DDT lead arsenate	Elm leaf beetle bagworm cankerworm	1,361
Kansas	DDT malathion		Small
Massachusetts	DDT	mosquitoes	23,540
Michigan	DDT lead arsenate malathion	pine shoot moth pine sawfly pine weevil	250
New Hampshire	lead arsenate	gypsy moth tent caterpillars	250
New Jersey	lead arsenate	bagworm	2,500-5,000
Ohio	DDT malathion chlordane	mosquitoes flies	678
Rhode Island	DDT lead arsenate	Elm bark beetle Elm leaf beetle	2,670
Virginia	DDT lead arsenate	bagworms	669
TOTAL			$ 68,848-75,848

* No reports received from Arkansas, Georgia, Indiana, Utah, Vermont.
No insecticides used in Alabama, Arizona, Colorado, Florida, Idaho, Kentucky, Louisiana, Maine, Maryland, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Mexico, New York, Nevada, North Carolina, North Dakota, Oklahoma, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Washington, West Virginia, Wisconsin, Wyoming.
** Includes cost of chemical only. Does not include cost of application.

* Secretary and ** Chairman, Chemicals Subcommittee, Committee on Roadside Construction and Maintenance, American Roadbuilders' Association.
* Naugatuck Chemical Division, U. S. Rubber Company, Bethany, Connecticut.
** Niagara Chemical Division, Food Machinery and Chemical Corp., Middleport, New York.

Calcium Phosphates

WHAT differences occur, if any, in nutrient value when superphosphates in mixed fertilizers are ammoniated? This question was admirably discussed by Dr. B. Raistrick* of Scottish Agricultural Industries. Ammoniation of superphosphates alone and in mixed fertilizers is more generally practiced by the fertilizer industry in the United States than in the United Kingdom, and therefore, Dr. Raistrick's comments and observations should be of wide-spread interest to American operating personnel. A digest of the original report follows.

The relative value of the several phosphates as sources of nutrient phosphorus can be assessed in the laboratory and agronomically. The problem is tied to differences in behavior of the calcium phosphates placed in a crop soil. Differences are determined by comparing ordinary phosphates containing water-soluble phosphorus with the same phosphates, ammoniated. Dr. Raistrick postulates that phosphorus applied to a soil can be transferred to the plant only through the medium of the soil solution. A concentration of the released phosphorus in the soil solution, which is too low to permit an optimal rate of uptake, identifies that phosphate fertilizer as an inefficient kind. The method of evaluation followed by the author was based on making repeated water extractions of the various kinds of calcium phosphates under test and the use of published data on their decomposition in the presence of water.

The conventional tests to determine the solubility of a phosphate in water cannot reliably assess its value as a source of nutrient phosphorus. Such tests tend to show that the phosphate is more or less available to the plant than is really the case. For example, the tests credit dicalcium phosphate with little or no value, whereas, citric and citrate solubility tests show it is of considerable value.

Well-known, at least to agronomists, is the fact that the uptake of phosphorus by a plant is much influenced by chemical and biological reactions between soil and fertilizer. The equilibrium between a soil and its solution is disturbed when fertilizer phosphate is introduced into the system. The applied fertilizer releases phosphate ions into the solution and simultaneously, but not necessarily at the same rate, similar ions are adsorbed by the soil's colloidal complex and some combine chemically with certain elements and precipitate. Hence the phosphate concentration of the soil solution at any one time will be determined by the solubility and rate of solution of the applied phosphate, and the adsorptive capacity of the colloidal complex. A state of equilibrium becomes established in the system, soil—soil solution—phosphatic fertilizer, and as phosphate ions are removed from the solution by plant roots, one or other of the solid phases of the system will release an equivalent amount of similar ions in an attempt to maintain the equilibrium. If the removed phosphate ions are replenished at the same rate as the plant uses them, the plant will be sufficiently nourished for optimal growth, insofar as phosphorus is concerned.

From this perhaps over simplified explanation of a complex series of reactions involving soil factors and phosphate ions, it appears that two important factors control the potential availability of a phosphatic fertilizer, namely, a) rate of solubility in the soil solution; and b) the portion of its phosphate content which will eventually dissolve to provide a concentration of ions adequate for the plant's optimal needs in the face of adsorption by the soil colloidal complex.

Reactions of Calcium Phosphates and Water

Monocalcium and dicalcium phosphates react with water as follows:

$$\underset{\text{monocalcium phosphorus}}{Ca(H_2PO_4)2} \longrightarrow \underset{\text{phosphoric acid}}{H_3PO_4} + \underset{\text{dicalciumphosphate}}{CaHPO_4}$$

$$\underset{\text{dicalcium phosphate}}{7CaHPO_4} + H_2O \longrightarrow \underset{\text{monocalcium hydroxyapatite phosphate}}{2Ca(H_2PO_4)_2 + Ca_5(PO_4)_3 \cdot (OH)}$$

The amount of disproportionation in the above reactions limits the value of a fertilizer based on calcium phosphate, since one of the products of decomposition dissolves more slowly than the original material. Hence, it is less likely to make all of its phosphate available to a growing crop in a reasonable time after application.

The decomposition of hydrated monocalcium phosphate in contact with water, as reported by Sanfourche and Focet.[1]* shows a disproportionation which in two hours increased as the ratio of phosphate

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* International Superphosphate Manufacturers Association, meeting in Lausanne, Switzerland, September 24-27, 1956.

1 Sonfourche, A. & Focet, B. Bull. Soc. Chem. France, 1953, *53*, 974.

2 Elmore, K. L. & Farr, T. D. Ind. & Eng. Chem. 1940, *32*, 580.

3 Sanfourche and Henry, J. Bull. Soc. Chem. France 1953, *53*, 1210.

as sources of plant nutrients

. . . a digest of results obtained in Scotland.
—Summarized by Dr. Vincent Sauchelli

to water increased. In their most dilute solutions, (1.3 gm. or less per 100 gm. water,) disproportionation did not occur, but at 20°C. the amount of monocalcium phosphate decomposed was 40.7% of the total. This was in a system in which solid $Ca(H_2PO_4)_2 \cdot H_2O$ was in contact with its saturated solution (70 gm. of $Ca(H_2PO_4)_2 \cdot H_2O$ + 100 gm. water.) The investigators Elmore and Farr[2] found that the maximum decomposition of $Ca(H_2PO_4)_2 \cdot H_2O$ that can occur at 35°C, is 46.5% in a system in which the $Ca(H_2PO_4)_2 \cdot H_2O$ is 48.5% and water, 51.5%. The discrepancies can be ascribed perhaps to experimental conditions. Sanfourche and Focet used a temperature 5°C. lower, and allowed less time for the system to reach equilibrium (2 hours versus 10 months) than the others, and their most concentrated system was more dilute.

Sanfourche and Henry[2] studied the decomposition of dicalcium phosphate in the presence of water. They equilibrated amounts of this phosphate varying from 0.1 to 10 gm. with one liter volumes of water for 10 days at about 20°C. Disproportionation occurred only when a few milligrams of tricalcium phosphate were added to the suspension, and then its extent depended upon the weight of the dicalcium phosphate used: at 0.1 gm. per liter no decomposition was detected; the amount of monocalcium phosphate formed increased to a maximum (equivalent to 58% of the total P_2O_5 in solution) with 1 gm. solid present, and then decreased with increasing amounts of solid, falling to 33% of the total P_2O_5 in the system to which 10 gm. dihydrated dicalcium phosphate $(CHPO_4) \cdot 2H_2O)$ were added per liter.

Dr. Raistrick studied the decomposition of some calcium phosphates, and determined how much phosphate was dissolved by means of successive water extractions. He used mono-and dicalcium phosphates and hydroxyapatite. Results are summarized in what follows: The term "hydroxyapatite" as used by A. Raistrick describes a solid phosphate with molar ratio $CaO:P_2O_5=3.33$. which corresponds to the formula $Ca_5(PO_4)_3 \cdot OH$. X-ray examination showed the product was pure.

The extractions of each phosphate were performed using two ratios of solid to water: a high and a low. The amount of phosphate when the lower ratio was used was fixed at a weight at which it would be substantially dissolved in 18 to 20 extractions each of 100 milliliters of water; the higher ratio was 10 times that of the lower. Because it is so easily soluble in water, monocalcium phosphate could not be used in these extractions. They therefore used quantities of phosphate and water for the lower ratio extraction comparable with those prescribed by the official British method of analyzing water-soluble P_2O_5. The higher ratio used was also 10 times the lower. The results are summarized in Tables 1 and 2.

Table 1.

Phosphate Concentrations of Extracts of $Ca(H_2PO_4)_2$.

Extract No.	P_2O_5 Grams per Liter Low solid/water ratio	High solid/water ratio
1	14.3	122
2	0.26	7.6

A certain amount of P_2O_5 was not dissolved by the extraction water. This is shown in Table 2 which also shows the solid/water ratios used in

(*Continued on Page 97*)

Part 1

WHEAT

A NEW era in the long struggle for effective chemical control of the "bunt smuts" of winter wheat in the Pacific Northwest began in 1956. This was the year when hexachlorobenzene was first recognized officially as a preferred seed treatment material for use against infection of wheat by both *soil-borne*, as well as *seed-borne* spores of *Tilletia* spp. causing the common bunt. Previously, this chemical had been found to be superior to others in soil application against the *soil-inhabiting* dwarf bunt species of *Tilletia*. Its superior performance for this purpose was the first suggestion that hexachlorobenzene has unique properties as a toxicant against *soil-borne* inoculum of the "bunt smuts" in the Pacific Northwest. Further experiments have provided abundant evidence that hexachlorobenzene applied to the seed greatly reduces infection by *soil-borne* spores of common bunt in this region. At the same time, however, it proved to be *ineffective* as a seed dressing against *soil-borne* dwarf bunt inoculum, despite its effectiveness against this smut when applied to the soil.

The contrasting effectiveness of hexachlorobenzene as a seed treatment against the *soil-borne* inoculum of both common and dwarf bunts in the Pacific Northwest serves to emphasize the basic problems inherent in the chemical control of these diseases in this region. These problems of control are related to certain aspects of the life cycles of the causal organisms. Both of these bunts may be *seed-borne* and both may be *soil-borne* from one season to the next. However, only in common bunt do the *seed-borne* spores germinate quickly enough to infect the seedlings. *Seed-borne* spores of dwarf bunt do not infect the seedling, apparently because they either do not germinate at all in that season, or else they germinate too slowly. Consequently, chemical seed treatment is effective against infection by *seed-borne* spores of common bunt, but has no value as a protectant against infection to *seed-borne* spores of dwarf bunt, simply because these spores have no immediate infection potential. It should be recognized, however, that seed treatment may destroy *seed-borne* sports of dwarf bunt, and thereby prevent introducing this disease into non-infested areas. This is an important consideration, in view of the difficult nature of the soil infestation problem. This has long been the crux of the wheat smut problem in the Pacific Northwest, because *soil-borne* inoculum has not been amenable to control by chemical means.

The problem of controlling common and dwarf bunts, caused by soil infestation in the Pacific Northwest, involves two important features: (1) the longevity of the inoculum in the soil, and (2) the stage of seedling development at which infection occurs. Common bunt infestation of the soil survives for one season only, and reinfestation must occur each year, to perpetuate the disease by that means (Photo at right). On the other hand, dwarf bunt infestation of the soil may survive up to seven or eight years and possibly longer. In either case, successful control by chemical means is contingent upon bringing the chemical or its vapor to bear in the immediate vicinity of the point of infection. In common bunt, infection has long been known to be in the very young seedling stage, prior to emergence. In dwarf bunt, however, infection apparently takes place in the older seedling stage, at or near the soil surface.* Theoretically, therefore, control of *soil-borne* common bunt by chemical treatment would require sub-surface application of the material, while surface or near-surface applications should be more effective against dwarf bunt infection. There is good circumstantial evidence to support this theory.

Attention was first focused on the bunticidal properties of hexachlorobenzene in France during the years of World War II, and probably had its genesis in a war-time shortage of mercury. It was so effective at various rates of application and in both liquid and dry preparations as to appear promising not only for war-emergency utilization, but as a permanent substitute for copper and the poisonous mercury compounds. A similar highly effective action of hexachlorobenzene against wheat bunt was later demonstrated in Canada and the United States during the post-war testing of new chemicals for control of cereal smut. The discovery of its unique property as a chemical weapon against infection by soil-borne inoculum of the "bunt smuts" in the Pacific Northwest was a direct outcome of the testing program in that region. The data from these tests have been reported periodically since 1952.

Historical developments in wheat seed treatment for bunt control in wheat in the Pacific Northwest progressed through the use of formaldehyde, copper carbonate, and mercurials in that order. The long-standing place of the ethylmercury preparations for wheat smut control in this region was challenged in the immediate post-war years (1945-1950) by preparations of phenylmercuriurea, phenyl mercury acetate, and cyano (methylmercuri) guanidine. In experimental tests, only the last named was always equal to or better than the ethylmercury products but it had scarcely become established in the region when the merits of hexachlorobenzene came into focus.

The polychlorobenzenes first came under scrutiny for wheat seed treatment in the Pacific Northwest in 1950, when a preparation of 20 per cent pentachloronitrobenzene was included in tests on the control of both seed-borne smuts in winter and spring wheats. It was comparably as effec-

* *Plant Disease Reporter* 40: 242-243, 1956.

SMUT CONTROL

in the Pacific Northwest

by C. S. Holton

Agricultural Research Service, Field Crops Research Branch, Regional Smut Research Laboratory, Pullman, Washington.

1956 wheat harvest scene in the Palouse area of Washington. The billowing cloud emanating from this combine is composed of countless billions of smut spores, reflecting a loss of 15,000 bushels of wheat on this farm alone. Such wind-borne spores come to settle on summer fallow land where they remain to germinate and infect wheat seedlings in the cool, moist fall season. Infection by these soil-borne spores can be prevented by treating the seed with hxachlorobenzene.

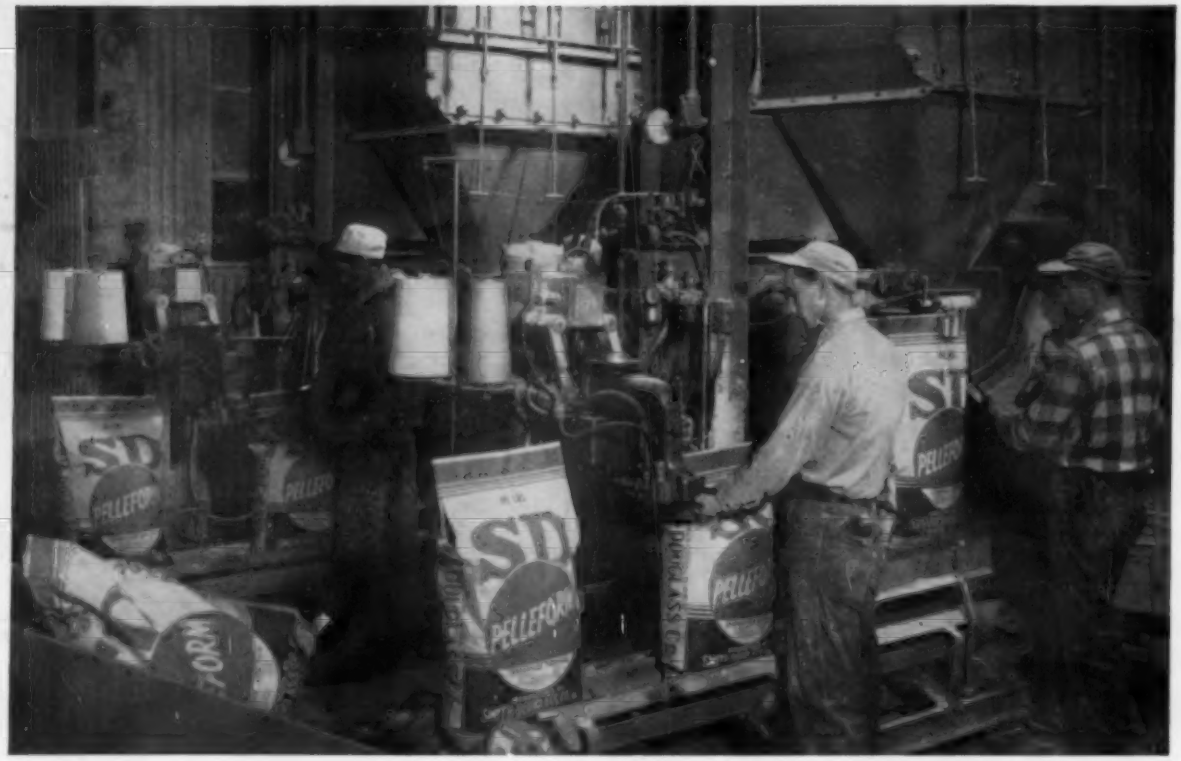
tive against the standard mercury preparations in these tests. In 1951, this material compared less favorably with mercury, but a 40 per cent formulation of hexachlorobenzene, under test for the first time, was as good as or better than mercury in controlling *seed-borne* smut. Its superior performance in this and other respects has been confirmed many times in a regional testing program designed to evaluate chemical preparations for wheat smut control in a wide range of formulations and under a wide range of conditions. The results of these tests over several years seemed to point inexorably toward eventual adoption of hexachlorobenzene as the officially recommended material for wheat seed treatment in the Pacific Northwest. In view of this, it may be appropriate to review the experimental evidences on which this recommendation is based.

In 1951-52, formulations of hexachlorobenzene containing 25, 40, and 60 per cent active ingredient were tested for control of *seedborne* smut on winter wheat, and the 40 per cent formulation was used also on spring wheat. All of these formulations, applied at one-half ounce to the bushel, completely eliminated smut under conditions favorable for the development of 43 to 67 per cent in the untreated control plots. In these same tests, three formulations of pentachloronitrobenzene were used, also at one-half ounce per bushel. One of these gave inadequate control on the winter wheat but the other two gave perfect control on spring wheat. All of the mercury materials and one copper compound used in these tests gave generally satisfactory control, while several miscellaneous compounds, including one antibiotic, were relatively ineffective.*

Also in 1951-52, tests were undertaken to determine whether infection by the soil-inhabiting dwarf bunt of winter wheat might be prevented by the application of fungicides to the soil at the time of seeding. Test plots were located in naturally-infested soil on five farms in Washington, Oregon, and Idaho. Four chemical preparations, including two mercury and two non-mercury compounds, were applied in the drill furrows by power equipment simultaneously with the seeding operation. Only one of these materials, hexochlorobenzene, 40 per cent, was significantly effective in controlling dwarf bunt under these conditions. Three of the 5 test areas had 32, 48, and 11 per cent dwarf bunt in the untreated rows as against 2, 0, and 0.7 per cent infection, respectively, in the hexachlorobenzene-treated rows. Regarding the other two plots, hexachlorobenzene was relatively ineffective in one of them while the degree of infection in the other one was too low for adequate evaluation. These results, though somewhat erratic, nevertheless established the fact that hexachlorobenzene has unique properties of significant potential value in the chemical control of wheat smut in the Pacific Northwest. Hence, further tests were undertaken, including not only soil-treatment for dwarf bunt but also seed treatment to determine its possible value as a *seed dressing* in controlling infection by soil-borne spores of both dwarf and common bunt.

(*Continued on Page 95*)

* *Plant Disease Reporter* 36: 424-425, 1952.



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ranch tests against cattle grubs with the systemic insecticide . .

DOW ET-57

A total of 207 cattle on eight ranches were treated in late June and early July with oral doses of Dow ET-57 at a rate of about 110 mg/kg. Equal numbers of treated and untreated cattle were maintained in each herd. Monthly counts of the grubs appearing in the backs of the cattle showed overall average grub control of 86.9%.

Robert Henry Jones and H. M. Brundrett, *Entomology Research Division* and R. D. Radeff, *Animal Disease* and *Parasite Research Division, Agr. Res. Serv., U.S.D.A.*

IN tests conducted during the 1955 cattle grub season at Kerrville, Tex., and Corvallis, Oreg. (McGregor *et al.* 1957), the systemic insecticide Dow ET-57 showed much promise for control of this serious cattle pest. As these experiments used small numbers of cattle, a large-scale experiment was deemed necessary to validate these preliminary data.

Eight ranches were selected where past experience had shown that large infestations of *Hypoderma lineatum* (De Vill.) could be expected.* The herds consisted of Hereford cattle except on the Dreiss ranch, which had Aberdeen-Angus. All ranches were located in the Kerrville area, and the herds were maintained in a manner typical of local range practices.

On each ranch, the herd was divided into three age groups—mature cows, yearling heifers, and heifer calves. Half of each group were treated and the remaining left as untreated controls. A few bulls were treated. The total number of treated animals was 207, and 202 were left untreated. The cattle were given an estimated 110 mg./kg. (range 100-120) of Dow ET-57 orally in a wettable-powder suspension containing 11 per cent of actual insecticide. Each animal's weight was estimated by three men accustomed to dealing with cattle. The dose administered was based on the average of their estimates. The accuracy of this method was checked by actual weighing in one herd. The true weights did not deviate more than 10 per cent from the estimated weights, and most were within 5 per cent. Each rancher was informed of the symptoms to be expected should poisoning appear and was assured recompense for any damages.

The cattle were drenched in the latter part of June and the first week of July. This was thought to be the most appropriate time for the use of systemic insecticide against cattle grubs in this area, as heel fly activity was over before April 1 and the larvae were expected to be present as first instars, primarily in the gullet. Calves born after April 1 were therefore not included in this experiment. The animals were inspected monthly, and grub counts were made. Monthly inspections were considered sufficient to note all grubs, as 45 days is the average, and 35 the minimum required for development in the back. The locations of grubs in the back were designated on a diagram so that cumulative counts could be kept.

The first infestations on ranches were observed from the last part of July to the middle of October, numbers were highest about the first week of December, and the experiment was concluded in January, 1957, af-

(*Continued on Page 95*)

* W. S. McGregor arranged cooperation at the ranches that were used in this experiment.

Table 1.

Accumulative grub counts for cows and yearling heifers, and the control due to treatment with Dow ET-57.

Ranch	Untreated			Treated			Percent Control
	Number of Animals		Total Number of Grubs	Number of Animals		Total Number of Grubs	
	Total	With Grubs		Total	With Grubs		
P. Dreiss	20	16	207	21	9	16	92.2
E. Henke	7	7	155	7	5	35	77.4
W. Henke	27	24	279	27	15	40	85.4
A. Kott	8	6	44	7	1	1	98.2
C. Peril *	24	14	102	27	2	3	97.6
F. Real	29	28	311	21	13	56	74.8
W. Schwethelm	12	11	161	13	7	11	94.0
Totals	127	106	1259	123	52	162	86.9

* Last inspection on September 19, 1956.

FUNGICIDE TESTS

Part 6

Tobacco Plant Beds

NEMATODES

Soil samples from plant beds in thirty six locations in North Carolina, where various soil fumigants were being tested, were assayed by Nusbaum and Todd to see which of six species of nematodes were still present after each treatment. The results indicate that methyl bromide gave outstanding control of all nemas. The stunt, meadow, and spiral nematodes were often as prevalent as the root knot nematode. In most locations if beds were well prepared, good control was also obtained by drenching the beds with either a mixture of allyl alcohol plus ethylene dibromide called Bedrench or one of allyl alcohol plus DD mixture. For summary of this work see Table 70.

Tomato

ROOT KNOT

In a comparison of DD, V-C 13, and Nemagon both liquid and granular, made by Epps at Charleston, South Carolina in six foot rows with tomatoes as the indicator crop, nematodes failed to develop but definite injury from one gallon of Nemagon per acre was reported, with a trace of phytotoxicity from lower dosage rates and from the 5 and 10 pound rates of granular Nemagon. The five gallon and 4.5 gallon rates for DD and V-C 13 were safe and are experimentors' second and first choice respectively. (48.)

Onion

BLOAT OR BULB NEMATODE *Ditylenchus dipsaci*

Four muckland fields known to be infested in Orange County, New York were fumigated with DD in September 1955 and replanted to onions, April 1956. No nematodes found this season while they were plentiful in unfumigated fields. Fifty gallons per acre in single application appeared to do as well as a split application of sixty gallons and fifty gallons applied three weeks after cyanamid six-hundred pounds had been disced in. No injury observed from the one hundred-ten gallons total application made in September when soil temperature was in the sixties, nor was odor evident at plowing the following spring. Although no checks were left in these tests no fields in continuous onion culture have ever been known to recover by themselves in New York. Moreover, in four other fields treated with ethylene dibromide (Dowfume 85) at nine gallons much bulb rot infection could be found. It is felt another year's experience must elapse before recommendation can be made, but DD is definitely superior for bulb nematode to ethylene dibromide. (26.)

ROOT KNOT NEMATODE

In a comparison of DD, Vapam, and Dowfume 85 made on New York muckland with tractor mounted injection equipment when soil temperature was 58° F. at six inch depth, Sherf found Vapam at twenty five gallons per acre less effective than the others. Dowfume 85 at four and one half gallons was phytotoxic to the onion crop grown the following summer and gave the lowest yield. First choice is DD at thirty gallons and second the same at forty gallons where onions are to follow the next spring. EDB is not recommended where onions are to follow treatment. (Table 71.)

Tomato, Egg Plant, Rice and Jute

SCLEROTIUM SEEDLING DISEASE

PCNB 75 thoroughly mixed with the top 3½ inches of soil in flats was reported from the Philippines by Sulit and Newhall to be very effective. Thirty five pounds of the 75% wettable powder was found adequate over a thirty day test period in a greenhouse, although some stunting was evident with cucumber and tomato. (Table 72.)

RHIZOCTONIA SEEDLING ROT

At the Central Experiment Station of the Philippines, good control was obtained by Sulit and Newhall from mixing small quantities of PCNB 75% W.P. with potting soil in flats subsequently sown with seeds of susceptable plants. An over all treatment of 35 lbs. per acre of soil 3½ inches deep gave adequate control with only a dittle stunting. (Table 73.)

SCLEROTIUM SEEDLING DISEASE

In comparing three concentrations of Mycostatin as a post-planting drench for the top three inches of infested soil sown with susceptable seeds, Sulit and Newhall in the Philippines report that although fairly good control was obtained at 100 ppm there was evident stunting from this and lower concentrations. (Table 74.)

TABLE 73
PCNB For Rhizoctonia Disease of Egg Plant, Rice, Jute and Tomato in the Philippines (63)

Soil treatment 3½" deep	% Diseased seedlings			
	Egg Plant	Rice	Jute	Tom.
Check	41.	45.	31	36
17. lbs. per acre	14.	13.	15	15
34. lbs. per acre	8.	7.	8	10
52. lbs. per acre	0.	0.	0	0

TABLE 74
Control of Sclerotium Seedling Disease by Mycostatin Post Planting Drenches in the Philippines (63).

Rate	% Diseased Seedlings			
	Eg. Plt.	Rice	Jute	Tom.
Check	41	42	42	38
25 ppm	25	24	27	26
50 ppm	20	20	21	18
100 ppm	12	11	11	12

TABLE 75
Control of Rhizoctonia Seedling Rot of Tomato, Egg Plant, Rice and Jute by one Post Planting Drench with Agrimycin 100 (63).

Rate	% Diseased Seedlings			
	Tom.	Eg. Plt.	Rice	Jute
Check	45	63	38	51
100 ppm	33	34	35	33
200 ppm	23	29	22	26
400 ppm	23	29	22	26

TABLE 76
Control of Rhizoctonia Seedling Rot by Soil Treatments With C&C974 (Mylone) in Philippines (63).

Rate	% Diseased Seedlings—1 Month			
	Kenaf	Jute	Eg. Plt.	Rice	Tom
Check	30	22	16	11	10
137 lbs. pa.	0	0	0	0	0
206 "	0	0	0	0	0
275 "	0	0	0	0	0

TABLE 77
Soil Fumigation For Tobacco Black Root Rot in Georgia (15).

Fumigant	Rate/a	Satisfactory Control	Exp. Pref.	Recomm.
Methyl bromide	300 lbs.	S	1	X
Vapam	100 gal.	S	2	X
Mylone	100 lbs.	No	3	
Ethylene Dibromide	10 gal.	No	4	

TABLE 78
Control of Potato Seed Piece Decay By Dip Treatments in Delaware (6).

Fungicide	Conc.	Control Rating
Semesan Bel—drench	3 oz./6qts.	2 U
captan—dip	2 lbs./100 gal.	1 S
Agri-Strep—dip	100 ppm	1 S
streptomycin sulfate plus captan—dip	100 ppm + 2 lbs./100	1+S
Strep. plus captan—dust	1% + 2%	1 S

Tomato, Egg Plant and Rice

RHIZOCTONIA SEEDLING ROT

In a comparison of different concentrations used as drenches on flats of innoculated soil sown with susceptable hosts it was found in the Philippines by Sulit and Newhall that 400 ppm of Agrimycin 100 gave fairly good control but that some stunting of growth occured even at 100 and 200 ppm. (Table 75.)

Philippine Report

In replicated greenhouse plots innoculated and treated with C6C974 (Mylone) before sowing with several susceptable crops in the Philippines, Sulit and Newhall obtained complete control with rates of 275, 206, and 138 lbs. per acre. The highest rate caused considerable stunting, particularly of rice which also turned yellow even at the lowest rate. Some retarding of growth noted at all rates with all crops. (Table 76.)

Tobacco

BLACK ROOT ROT

In a comparison of four soil fumigants at Albany, Georgia, Foster reports methyl bromide 300 pounds and Vapam 100 gallons as better than Mylone at 100 pounds or ethylene dibromide at ten gallons. No toxicity observed if planting delayed two weeks. (Table 77.)

Field Crops

Potato

SEED PIECE DECAY

From stand counts in field plots made in Delaware by Crossan and Lloyd, Semesan Bel used as a drench was not satisfactory on account of injury while four other materials used as dips or in one case as a dust were all satisfactory and safe. First preference was for streptomycin sulfate plus captan as a seed dip. (Table 78.)

Idaho Report

In a comparison of four materials as seed piece dips in Idaho, Gutherie found Semesan Bel, one pound in seven gallons and Terraclor, one pound in ten gallons, superior to Phygon or Agrimycin, concentration not given, from standpoints of safety and control. The last two were not believed worthy of further trial. Semesan Bel is first choice and is being recommended. (17.)

South Carolina Report

At Charleston, South Carolina three antibiotics were compared with captan as preplanting seed treatments. A trace of injury seemed to result from captan and Phytomycin and first choice in these preliminary trials went to Streptomycin and Agrimycin from standpoints of control and fields. (Table 79.)

LATE BLIGHT

Ten applications of ten fungicides to replicated field plots in Pennsylvania resulted in significant control and yield increases from the use of Manzate, S.D.D. + Zn, Kemate, and Vancide Z65, in that order, according to Fink. Manzate was particularly effective. Ineffectual were Griseofulvin, Copper-Zinc, Omadine Zn and Mn, and Tennam 5 and 7. (Table 80.)

Delaware Report

In Delaware, Heuberger and Brown compared five materials from each of two sources and found Captan the only one that failed to give satisfactory control. Bordeaux 6-3-50 was the only one showing phytotoxicity. Zineb was first choice with Maneb and Nabam second. Tribasic copper and Brodeaux were in third and fourth place from both yield and preference standingpoints. All but captan are recommended. (Table 81.)

Long Island Report

Kemate (B622) or Dyrene was tested on Long Island at four dosage rates in 100 gallons of water for the effect on yield, tuber infection and tuber specific gravity. These rates had no effect on specific gravity. They all gave complete control of tuber rot at harvest except the lowest rate of two pounds, but although there was a notable increase in yield in going from 2 to 4, 6, and 8 pounds dosage, it is believed yields may not justify going above three pounds. (Table 82.)

On Long Island, Partyka rated fourteen fungicides on the basis of their ability to prevent tuber infection at time of digging. Power sprayer was used on replicated field plots and approximately 110 g.p.a. were put on per application. Defoliation readings made in August showed which materials were failing to control and these are obviously correlated rather well with the higher tuber infections. (Table 83.)

LATE BLIGHT

In a test of different dosage rates of captan in relation to blight control on tubers at harvest, and on specific gravity, Partyka reports little difference between 2, 3, 4, 6, and 8 pounds per 100 gallons per acre on blight control as measured by yields and tuber infection. Probably the three pounds is still the most recommendable. There was a slight difference in specific gravity corresponding to the degree of control and yield, the lower the control the more immature the potatoes and lighter the weight. There was no burning even at the highest concentration used. (Table 84.)

BLIGHT

In a comparison of fourteen fungicides in a full spray schedule on Long Island at 1X concentrations to see if the tuber density or specific gravity was correlated with chemical foliage treatment it was found by Partyka that those which

(*Continued on Page 99*)

TABLE 79
Seed Piece Decay Control on Potatoes in South Carolina (48)

Materials	Rate	Yields	Exp. Pref.
Captan	2-100 dip	4	3
"	7½% dust	4	3
Phytomycin	100 ppm	3	2
Agrimycin	100 ppm	3	1
Streptomycin dip	100 ppm	2	1
" "	50 ppm	2	1
Streptomycin dust	0.05%	2	1
" "	0.1 %	2	1
" "	0.2 %	2	1

TABLE 81
Control of Potatoe Late Blight in Delaware (7).

Fungicide	Lbs./100	Control	Yield Order	Exper. Pref.
zineb	2	1 — S	1	1
zineb	2	1 — S	1	1
maneb	2	1 — S	1	2
maneb	2	1 — S	1	2
nabam + $ZnSO_4$	2 qts. — ¾ lb.	2 — S	2	2
nabam + $ZnSO_4$	"	2 — S	2	2
captan	3	4 — U	2	
captan	2	4 — U	4	
Tribasic	3	3 — S	3	3
Bordeaux	12-6	1 — S	4	4

TABLE 80
Defoliation and Yield of Katahdin Potatoes Sprayed With Ten Fungicides For Control of Late Blight, Penn. State (45)

Fungicide	Lbs./100 gal.	% Defoliation	Yield in bu. per acre
None		100	315.5
Manzate	2	0	726.8*
S.D.D. + $ZnSO_4$	2 qt. + ½ lb.	1-5	585.4*
Kemate	2	50-75	566.4*
Vancide Z65	2	10-25	470.4*
Tennam 7	2	50-75	407.5
Omadine Mn	2	100	395.9
Tennam 5	2	50-75	383.3
Omadine Zn	2	100	381.4
Griseofulvin	100 p.p.m.	100	361.0
Copper-zinc	2	25-50	346.5
L.S.D.			120

*Highly significant.

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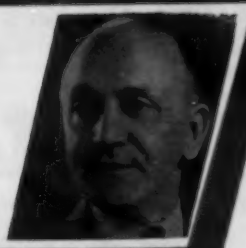
Fertilizer Views and News



By Vincent Sauchelli

Clay Saves Fertilizer Nutrients

"SOIL bank" is currently being popularized as a conservation concept. Agronomists and soil scientists have also used the same phrase to explain some facts about the input and output of fertilizers as a phase of farm management. You know the argument. The soil is likened to a financial bank; if you draw checks against your bank account greater in total amount than the deposit you get into trouble. You must put back into the account at least as much as you take out to keep the account active. Although this over-simplifies the situation insofar as the soil is concerned it is a useful concept in teaching.

That the soil can act efficiently as a bank in which to store plant food for future conversion into the legal tender of farm products was strikingly demonstrated in Missouri and neighboring states during the recent drouths. For example, at the Missouri University South Farms the unused plant food carried over from the dry season of 1954 alone accounted for 70 bushels per acre corn yields in 1955. It was estimated that the absence of soil moisture caused by the extreme drouth permitted the soil to regain from 100 to 300 pounds of nitrogen which produced yields as high as those on adjacent test plots which received generous amounts of plant nutrients the same year. The carry-over fertility showed its effectiveness to the highest degree on soil having a substantial amount of clay in the subsoil. This effect of clay is of direct interest to all concerned with fertilizer usage. A complete understanding of the role which the clay portion of a soil plays in fertility and plant growth has not been satisfactorily achieved by science. However, what is known about it is fascinating.

What is clay

Clay comprises the fraction of mineral matter of a soil having particles less than 0.002 millimeter diameter. Ordinarily we think of clay as a sticky, plastic substance which like putty can be molded into all shapes. Clay, however, is composed of tiny crystals made up of chemical elements in a definite arrangement such as silicon, aluminum, hydrogen, oxygen and others, like any other crystals. Many kinds of clay crystals are known, the most common being montmorillonite, kaolinite and illite. In temperate and cool climates the silicate clays comprise the largest portion of the soil's clay fraction; in tropical climates oxides of iron and aluminum usually make up the bulk of the clays. The clay crystal has a negative electrical charge which gives it the property of holding positively charged ions or "cations," of which the following are common examples: H^+ (hydrogen), Ca^{++} (calcium), Mg^{++} (magnesium), K^+ (potassium), Na^+ (sodium) and NH_4^+ (ammonium). Clay acts as a weak acid in which role the clay is surrounded by H^+, that is, hydrogen ions. If the proportion of H^+ ions is high the soil is acid in reaction because hydrogen is the effective acid factor. The H^+ ions can be displaced by other positive ions or cations as listed above and when as much as 95% of the positions on the clay are held by these other cations the soil will be alkaline.

An important thing to remember is that the cations held on the clay surface are exchangeable. Potassium (K^+) may displace H^+ or NH_4^+ may be exchanged for H^+. The capacity of a soil to hold exchangeable ions is called its exchange capacity and is generally expressed in milliequivalents (M.E.) per 100 grams of soil. Milliequivalents here means one milligram of hydrogen or its equivalent, and in an acre this means 20 pounds of hydrogen per 2,000,000 lbs. of soil.

Fertilizer elements held

When a fertilizer is applied to a soil, say the salt ammonium nitrate (NH_4NO_3), its soluble elements dissociate into its component ions, NH_4^+ and NO_3^-, the one positive, the other negative. The clay portion having a negative charge will attract to itself the positive ion, in this case NH_4^+. If the positions on the clay crystal are held by H^+ ions, the NH_4^+ ions will displace the H^+ ions, one for one. The NO_3^- ions, having a negative charge, will be repelled by the negatively charged clay crystal. However, there may be cations such as Na^+ or $^{++}$ or K^+ in the soil solution free from the clay and the nitrate ion (NO_3^-) from the applied ammonium nitrate will be free to combine with these other cations. The ammonium ion, NH_4^+, as we said, will be held on the surface of the clay crystal until displaced by a stronger cation or utilized by microbial agencies and eventually released to plant roots as an available nitrogen compound. The roots of some plants are able to utilize the ammonium ion directly.

We started this item by reporting how nitrogen was carried over in a drouth period until released eventually by rains. The mechanism by which the nitrogen and other plant nutrients is held by the soil is to be found in the electrical charge of the clay portion of the soil as previously

described. We have simplified the explanation; the entire process is complex but well understood by soil scientists.

Balance of Plant Nutrients

THE expression "balanced fertilizers" is commonly met with in writings and conversations on crop feeding. What is actually meant by it? It is allied to the expression "balanced ration" of the livestock industry, but is the kinship direct and positive? It seems to me the balance that is important is not so much in the fertilizer formulation, as that in the soil after the fertilizer has been applied and reacted with the soil elements. In no accurate sense can a fertilizer be compared with a balanced ration for an animal. Plant physiologists have emphasized time and again that the feeding of animals with organic foodstuffs, and the absorption of mineral nutrients by plants are two separate and distinct operations.

In field tests determining the influence of individual plant nutrients, the effect of one element is usually obtained by comparing plots having the three major nutrients, NPK, with plots minus that one particular element, says N-K, or N-P or P-K. It is important to know the extent of dependence of one nutrient upon the presence or absence of the other. In potatoes, for example, the response to phosphorus increases with the amounts of nitrogen or potash present, but nitrogen and potash act much more independently. For other crops, sugar beets, for example, the response to nitrogen increases with the amount of potash, and apparently without the benefit of phosphorus to any large extent. These examples are cited to illustrate the fact that in crop feeding, the interactions of the fertilizer elements is a factor which must be considered and a factor that somehow conflicts positively with the notion of having "proper balance" in the fertilizer formulation.

Let us consider the potassium nutrient of the applied fertilizer in the light of the so-called "Law of limiting or controlling factors." We have a soil with a small capacity of supplying available potassium. If now more nitrogen and phosphorus are applied to this soil in a fertilizer, and the crop is increased, the plants will have less potassium per unit weight and will show the characteristic potassium deficiency symptoms in an acute form. To raise the supply of one nutrient, automatically increases the potential response to another, but it is not right to say that the increase in the first nutrient caused the deficiency of the second.

Potassium reacts in the soil with colloidal materials, such as clays, humus and so on. Some of this applied potassium may be fixed, that is, absorbed on the colloid, and thus go out of solution. But in doing this, the potassium displaces calcium or magnesium, which in turn go into the soil solution. This is what happens when potassium is applied as fertilizer to heavy clay soils: calcium, magnesium, sodium are liberated, the potassium is fixed. This fixing power of soils affects phosphorus and ammoniates as well as potassium and other nutrients and is a very important factor in crop fertilization and so-called "properly balanced fertilizers."

Phosphorus undergoes chemical changes in the soil which differ from those which affect potassium. A phosphate that is easily soluble in water before application to a soil becomes considerably less soluble after its incorporation in the soil. This fact may not be ignored in evaluating different phosphatic materials. Of what benefit is it to apply a relatively expensive, easily soluble-in-water phosphate to a soil, if shortly after it is applied it is converted by soil agencies to a less easily soluble phosphate?

Correction

In this column, May issue, under the item Sulfur, page 50, it was stated that "about half the weight of ordinary superphosphates is calcium sulfate, which contains about 12 per cent sulfur." This should have read: "ordinary superphosphates contain about 12 per cent sulfur. Pure calcium sulfate alone contains 23.5 per cent sulfur."

Yield and Quality

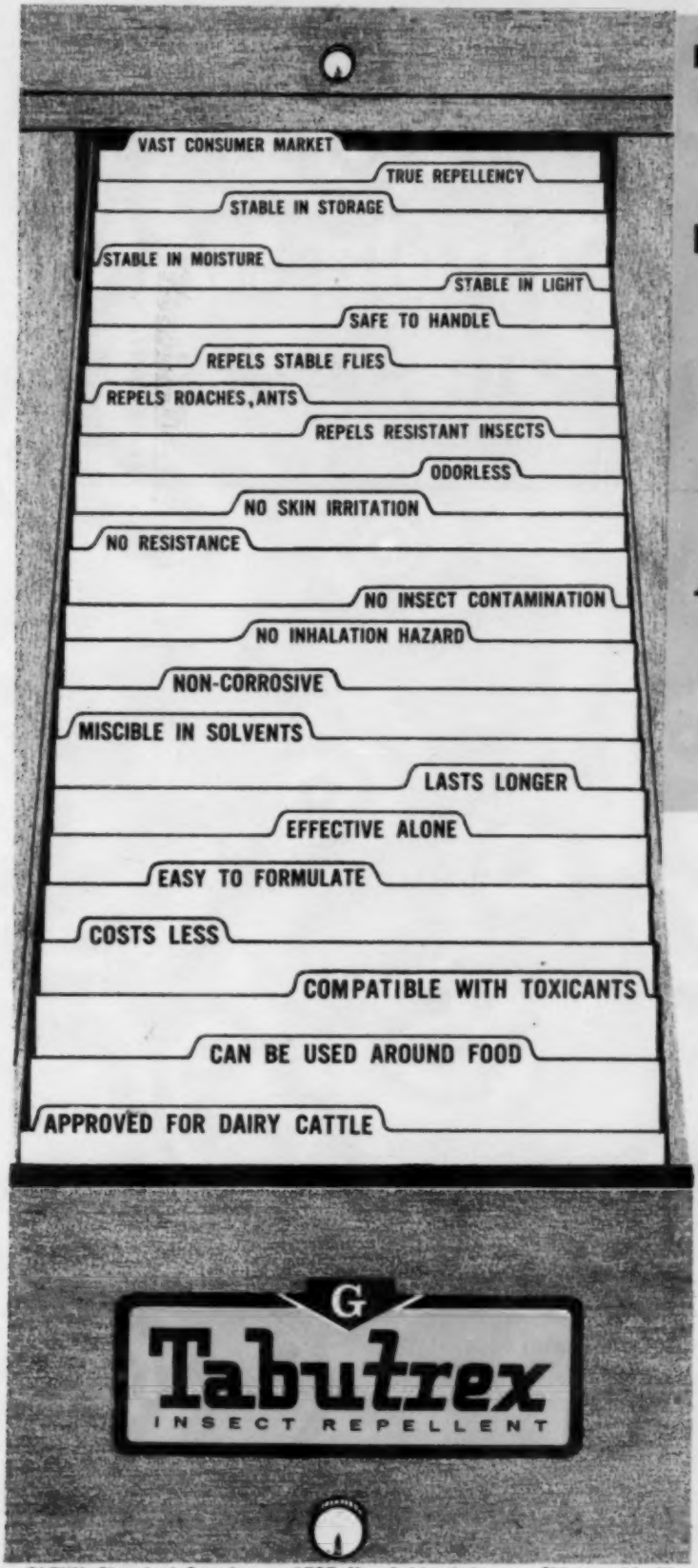
A TOMATO grower in Clarksville, Tennessee, has set his crop goal this season at 100,000 pounds of tomatoes per acre—50 tons! Back in 1952 he produced 85,000 pounds. He uses a complete fertilizer (4-12-8) at the rate of at least 2 tons per acre and follows good soil management practices to hold moisture. He keeps a complete record of every row of tomatoes and can tell how the row was managed and yield and quality of the crop for any given day. This grower has used the same 1½ acres of ground on which to grow his tomatoes for the past 25 years. The crop nets a good profit apparently proving the quality is satisfactory.

What is "Quality?"

THE United State Dept. of Agriculture has been investigating the effects of pre-harvest factors on the yield and quality of tomatoes. They found after a 3-year study that the weather at harvest time and the variety of the tomato affect yield and quality more than any of the other factors studied among which were soil fertility level, nutrient foliar sprays and time of planting. High temperatures, they report, limit the color. At 85°F. the plant stops producing the chemical (lycopene) which causes the red color, and in its place it forms carotene which produces the yellow color. The application of nitrogen, phosphorus, and magnesium at higher than normal rates had no appreciable influence on yield or quality; nor did magnesium and boron when applied as foliar sprays. Chelated calcium sprays showed some promise, as did irrigation during the August dry spell. They believe color and firmness—two qualities much in demand—may be improved chiefly by the development of new varieties.

In so much of the agricultural research that has hitherto been reported, the objective all too often has been focused on getting higher and still higher yields, with little consideration as to nutritional quality. Is it right to evaluate production entirely on the basis of pounds, bushels or tons? Shouldn't we want to know if a ton of tomatoes or a bushel of corn grown on fertilized land are of the same or higher nutritive value as those produced on less fertile, impoverished soil? Wherein is the difference, if any, and why? Quality

(*Continue don Page* 97)



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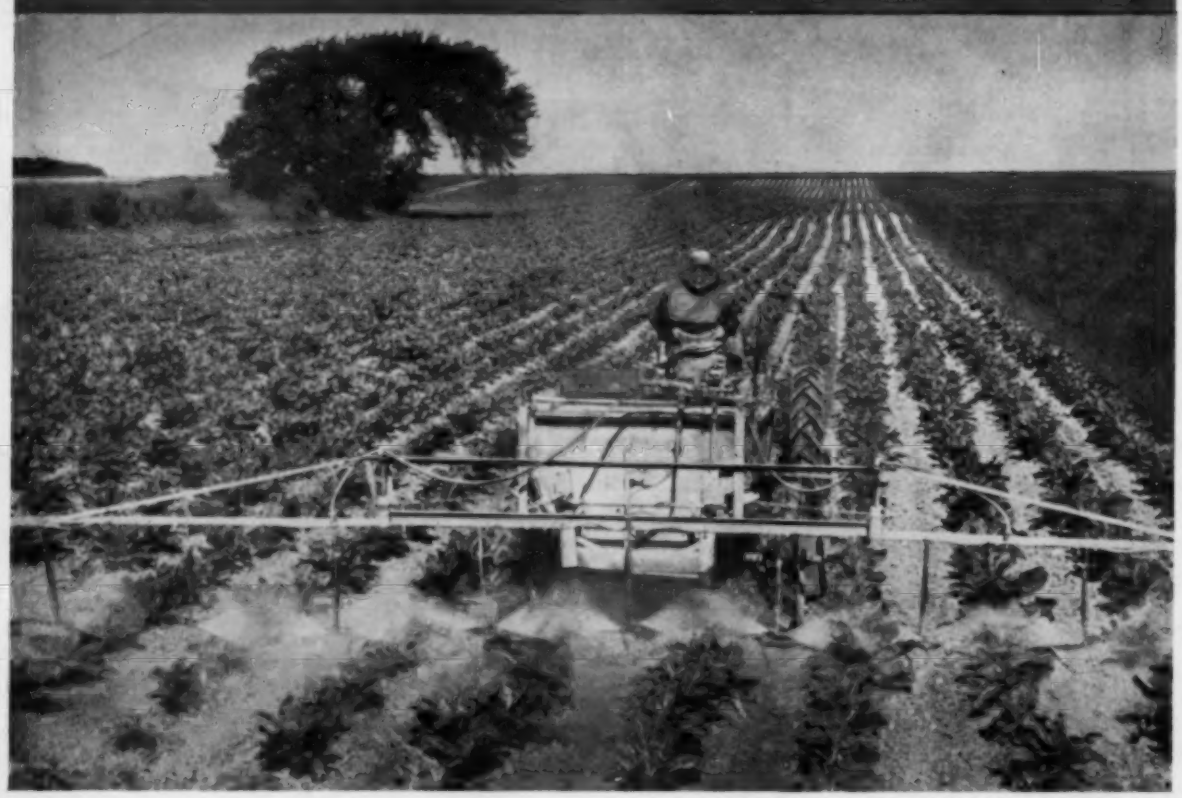

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LISTENING POST

By Paul Miller

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Epidemics and Identification Section, Horticultural Crops Research Branch, United States Department of Agriculture, Beltsville, Maryland.

Control of Peach Leaf Curl With Omadine and of Brown Rot With Omadine and Certain Antibiotics

MICHAEL Szkolnik and J. M. Hamilton of the New York State Agricultural Experiment Station report* results of tests with various chemicals for the control of peach leaf curl caused by the fungus *Taphrina deformans* and of brown rot caused by *Monilinia fructicola*. Their findings are reviewed below:

Results with Leaf Curl: The Omadine experimental fungicide OM 1565, a 50% wettable powder formulation of the iron salt of 2-pyridinethione 1-oxide, at 1-100 was compared with the standard bordeaux mixture, Fermate, Elgetol, Dn #2, and lime sulfur, in fall and spring dormant applications for the control of peach leaf curl . . . also evaluated for the first time were Thioneb, Thylate, and Vancide A which were included in the spring dormant application.

OM 1565 gave nearly complete control of leaf curl on the Sunhigh, Triogem, and Hale Haven peaches in both fall and spring applications, not unlike that of all the standards with the exception of bordeaux mixture. The fall application of bordeaux mixture, especially the 5-5-100, was weak on control, particularly on the varieties with a higher incidence of infection.

Thylate and Vancide A tested in the spring dormant spray on Kalhaven gave equally satisfactory control of leaf curl, whereas Thioneb applied at the same time failed to control the disease.

Pre-Harvest Control of Brown Rot: Micronized sulfur, Captan 50W, and Thioneb were comparatively evaluated for the control of brown rot . . . in a one to three pre-harvest spray orchard program on Elberta peach in 1955. By the time the second application was completed, it was established through tests on post-harvest control of brown rot through dip treatments that the Omadine OM 1563, a 50% wettable powder formulation of the zinc salt of 2-pyridinethione 1-oxides, was more effective than the standards captan and sulfur. It was then included in the orchard test in a single application just prior to harvest. Control data were obtained on peaches with a fresh residue of fungicides as well as on those that were exposed to 1 inch natural rainfall which was instrumental in depletion of protective residue.

From these results it is evident that three sprays of Micronized 4-100 and Thioneb 1¼-100 are necessary for satisfactory protection. The single pre-harvest application of OM 1563 1-100 and Captan 50W 2-100 were about equally as effective as the three sprays of Micronized and Thioneb. It could be that the Thioneb would give a better performance at a higher concentration.

The data for the peaches receiving ample rainfall indicate the relative improvement of control with repeated applications, but more information is desired on retention and redistribution of the fungicides.

Dip Treatments for Control of Brown Rot on Harvested Fruit: In consideration of the heavy losses of peaches from brown rot developing after harvest, many materials have been evaluated in post-harvest dip treatments. The more routine treatments consisted of immersion of healthy, injury-free fruit for 30 seconds in the respective fungicidal preparations. When dry, the peaches were inoculated with a brown rot spore suspension and then kept in an incubation chamber for 15 hours at 100 per cent relative humidity and 75° F. The fruit was then kept at room conditions until brown rot data were taken, usually four days after treatment and inoculation. The control performance of Micronized and captan, included as standards in these tests, was mediocre. Captan caused light to moderate injury on some varieties. The performance of Omadine OM 1563 at only 1-100 was consistently superior to that of the standards. It caused no significant injury to the peaches. The manganese salt, OM 1564, was not nearly so effective as the zinc salt OM 1563.

The antibiotics mycostatin, fungichromin, and oligomycin gave very good protection against brown rot, especially at concentrations of 100 and 200 ppm. The performance with these was similar to that obtained with OM 1563. There was no observable injury with the antibiotics.

* Michael Szkolnik and J. M. Hamilton. Control of peach leaf curl with Omadine and of brown rot with omadine and certain antibiotics. *Plant Disease Reporter* 41: 289-292. Apr. 15, 1957. (The authors acknowledge the aid of the various manufacturers who supplied test materials.)

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The soluble antibiotics have a particular advantage over insoluble fungicides, especially in bulk dip treatment. They would not tend to accumulate on the fruit following drainage of the dip, thereby avoiding the presence of unsightly excessive residues on the fruit and the injury that might occur as the result of excessive deposit. Such excessive residue and pronounced injury occurred when bushel lots of peaches were dipped in captan.

Excellent control of brown rot without fruit injury was obtained with the new antibiotic Eulicin at 100 ppm. Unfortunately, the mammalian toxicity of this antibiotic is apparently too high to permit its use on edible products.

Thylate did not provide as good protection against brown rot as did either captan or Micronized. The Dow M-245 gave rather poor control at a concentration of 0.4% which caused appreciable injury. This material gave excellent control at 0.1% without injury in the 1954 tests.★★

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is head — Plant Pest Survey Section, Plant Pest Control Branch, U. S. Department of Agriculture. His observations are based on latest reports from collaborators in the U.S.D.A.'s pest surveys throughout the U. S.

By Kelvin Dorward

Alfalfa Aphid Damage Lower

The spotted alfalfa aphid by the first of June had not reached the damaging proportions that it had in any previous year since its discovery in this country in 1954. New Mexico had light to heavy infestations in the southern area, and Utah reported damaging populations in late May with 600 acres of alfalfa being treated in Washington County. Some treatment was necessary in Nye County, Nevada. Predators have been an important factor in reducing populations in the Yuma, Arizona area. The first spotted alfalfa aphid specimen found in Nebraska this year was taken May 23 in Nemaha County. Populations in eastern states known to be infested were generally light up to early June. Some honeydew was reported in North Carolina.

Army and Cutworms Heavy

Armyworms by the latter part of May had developed into outbreak numbers in several Maryland counties. Counts up to ten worms per linear foot of row were recorded. Barley, hay mixtures and corn were being damaged and treatment was underway. Delaware reported an outbreak from eastern Kent County and in Virginia outbreaks were recorded and controls required in eastern and northern counties.

In local areas of Davie County, North Carolina, armyworms were responsible for clipping one-third of the heads in small grain fields. From northwestern Arkansas damage was reported as being caused by a mixture of armyworms and variegated cutworms. In central Texas armyworm was generally heavy in small grains with populations up to 40 per square foot. Movement to corn was underway in this area. Damaging infestations occurred throughout Oklahoma with most control measures being applied in southern areas.

The armyworm threat was over in Louisiana and parasites and disease were killing up to 40 percent of the larvae in southern Missouri.

In late May, the variegated cutworm was causing damage in several states. In southwest Missouri heavy populations were destroying new alfalfa growth and controls were necessary. In southeast Kansas populations up to 6 per square foot were recorded in alfalfa. Small grain and vetch were infested in north central Texas. Oklahoma reported medium to heavy damage to legumes.

Pea Aphid Building Up

The pea aphid, which caused serious damage to alfalfa in large areas of the United States in 1956, is again building up to damaging numbers in various areas this season. By the latter part of May, the insect was more serious in the Yuma, Arizona, area than in the past 5 years, and causing more damage than the spotted alfalfa aphid in many fields. The encouraging note was that by the first of June the aphids were apparently on the decline. Populations in Utah were more abundant in the northern and southern areas than elsewhere in the state. In north central Texas, counts ranged from light to heavy on vetch with counts of 15 to over 100 aphids per net sweep. In northeast Kansas late-May counts ranged from 160 to 2800 per 25 sweeps. The aphid increased rapidly and became abundant on alfalfa during the last half of May in southeast Nebraska.

Heavy populations were causing damage by the first of June in several areas of Minnesota. Counts up to 22 aphids per sweep were recorded in the central area of the state. Increases were recorded in South Dakota, Colorado and southeastern Illinois. The aphid was abundant in Lewis and Clark and Yellowstone Counties, Montana but parasitism was high in Yellowstone County.

In the eastern part of the United States, heavy populations of pea aphids were not as numerous as in the west; however, heavy infestations were found on alfalfa in areas of West Virginia, Virginia, Maryland and Rhode Island. Predators and parasites were active in Virgina.

Other Insect Activity

Plum curculio populations were on the increase in untreated orchards in the Vincennes, Indiana, area by late May. In the Carbondale, Illinois area, large numbers were present with more damage than in 1956. Populations were on the decrease at Wooster, Ohio and in both Pennsylvania and Rhode Island cuts were present on fruit. At Fort Valley, Georgia, first-generation adults were expected to emerge the last week in May.

(*Continued on Page* 103)

Ten days: Salt block iodized with potassium iodide loses KI content rapidly—within ten days.

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INDUSTRY MEETING CALENDAR

July 11-12—Great Plains Anhydrous Ammonia Meeting, Kansas State College, Manhattan, Kansas.

July 17-19—Southwestern Fertilizer Conference and Grade Hearing, Buccaneer Hotel, Galveston, Texas.

Aug. 13-14 — Ohio Pesticide Institute, Ohio Agricultural Experiment Station, Wooster, O.

Aug. 14—Connecticut Agricultural Experiment Station Field Day, Mt. Carmel, Conn.

Aug. 26-28—American Phytopathological Society Meeting to be held in conjunction with The American Institute of Biological Sciences, Stanford University, Palo Alto, Calif.

Sept. 4-6—Annual meeting, National Agricultural Chemicals Association, Hotels Essex & Sussex, and Monmouth, Spring Lake, N. J.

Sept. 5-6—Great Lakes States Anhydrous Ammonia Meeting, Michigan State University, East Lansing, Mich.

Sept. 8-15 — International Congress of Crop Protection, fourth international meeting, Hamburg, Germany.

Sept. 11-13—Florida Entomological Society, San Juan Hotel, Orlando Fla.

Oct. 2-4—Beltwide Cotton Mechanization Conference, Shreveport, La.

Oct. 3-5 — Pacific Northwest Plant Food Assn., Sun Valley, Idaho.

Oct. 7-8 — Western Agricultural Chemicals Assn., Villa Hotel, San Mateo, Calif.

Oct. 17-18—Assn. of American Fertilizer Control Officials, Shoreham Hotel, Washington, D. C.

Oct. 29-31 — Entomological Society of Canada, and Entomological Society of Alberta, Lethbridge, Alta., Canada.

Nov. 3-5—California Fertilizer Association, St. Francis Hotel, San Francisco, Calif.

Nov. 6-8—Fertilizer Industry Round Table, Sheraton Park Hotel, at Washington, D. C.

Nov. 17-19—National Fertilizer Solutions Assn., Netherland-Hilton Hotel, Cincinnati, Ohio.

Dec. 2-5—Entomological Society of America, National meeting jointly with cotton states ESA, Hotel Peabody, Memphis, Tenn.

Dec. 8-12 — Chemical Specialties Manufacturers Association, Hollywood Beach Hotel, Hollywood, Fla.

Dec. 9-12—Vegetable Growers Association of America, Jung Hotel, New Orleans.

Dec. 10-12 — North Central Weed Control Conference, Hotel Savoy, Des Moines, Iowa.

Dec. 11-13—Agricultural Ammonia Institute, Hotel Marion, Little Rock, Ark.

Dec. 12-13—Cotton Insect Control Conference, Peabody Hotel, Memphis, Tenn.

Jan. 4-5—1958 Texas Fertilizer Conference, Texas A&M, College Station, Texas.

Jan. 13-15—1958 Weed Society of America and Southern Weed Conference, Peabody Hotel, Memphis, Tenn.

Jan. 21-23 — 1958 California Weed Conference, San Jose, Calif.

March 4-5 — 1958 Western Cotton Production Conference, Hotel Cortez, El Paso, Texas.

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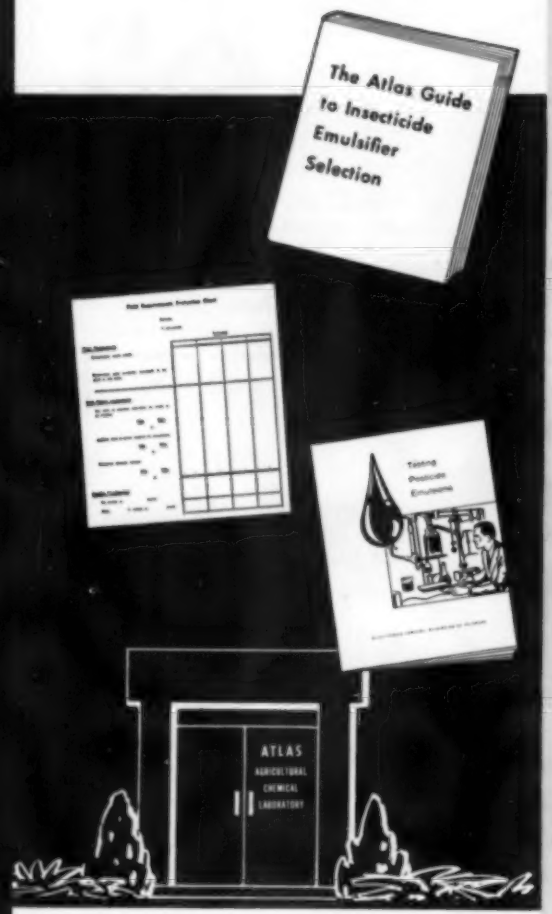

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TECHNICAL SECTION

Survey Seed Treatments

Seed oats and seed wheat which had been treated with chemicals were well protected against seed-borne diseases of these crops, but most forage crop seeds proved to be unresponsive to seed treatment.

These observations followed a survey of treated seeds of small grains and forage crops by Cornell and State university scientists at Ithaca and at the Experiment Station in Geneva, N. Y. Complete evaluation of a chemical seed treatment or of a treated lot of seed usually requires a growing test in the field as well as a laboratory test, according to the seed specialists conducting the tests.

Effects of volatile and nonvolatile chemicals were especially noted. Volatile mercurials proved highly effective in controlling head smut of field bromegrass grown for seed, but most forage crop seeds did not respond to chemical treatments.

•

Screw Worm Eradication Pgm.

A large-scale field test for study of the eradication of screw-worm is being conducted in Orlando, Florida, by the USDA, under the direction of R. C. Bushland. Procedures and equipment for eradication by using sterile male screw-worm flies are being studied and evaluated in the tests.

The screw-worm problem represents a loss of $10 to 15 million annually to livestockmen in the Southeast. In Florida, it is estimated that 80 to 85 per cent of all wounds of cattle were infested between June 7, 1956 and May, 1957. A program for screw worm eradication is not currently underway in the Southeast, and will not be conducted until such a program is authorized and funds are made available. The Florida tests are being conducted as a proving ground for procedures and equipment, and training personnel.

The test program consists of mass rearing sterile male screw worms and releasing 500 such sterile male adults per square mile by small airplane in the test area each week, for four months. USDA officials believe the program can be used to eradicate the screwworm problem in the Southeast. They estimate that such an overall program would cost approximately 9 to 10 million dollars.

•

Glyodin Fungicide Tests

Recent tests conducted at Maryland and New Jersey experiment stations showed Crag Glyodin, a fungicide for fruit diseases, to increase effectiveness of some commonly used insecticides when applied in combination sprays. Glyodin, in combination with DDT, was used as a 4X concentrate at the range of 4½ quarts per 100 gallons of spray in the Maryland work, and was tested on two-spotted mites. Glyodin gave the best results among several fungicides tested.

New Jersey experiments showed Glyodin to be best of several fungicides tested for reduction of mite counts on leaves of Stayman and Starking apples.

Other tests conducted at agricultural experiment stations in Virginia, Pennsylvania, and Massachusetts show that Glyodin increases the effectiveness of insecticides. Malathion, dieldrin, methoxychlor, and other commonly-used insecticides all gave significantly better control of insect pests when applied in combination with Glyodin.

Rearing of Corn Borers

A booklet describing the techniques of continuous mass rearing of the European corn borer in the laboratory has been issued by the Illinois Natural History Survey, Urbana, Ill.

With the development of satisfactory rearing methods, it is possible to develop techniques for special experimental work such as: applying insecticides and pathogens to food or substrate, observing reactions of larvae during periods of exposure to insecticides or pathogens, and the estimating of amounts of insecticides or pathogens ingested.

The most satisfactory food for the corn borer reared under laboratory conditions was found to be the pods of string beans.

•

Potato Flea Beetle Control

The problem of controlling potato flea beetles, which have shown some signs of resistance to the DDT in the northeast, has been reported on by the Rhode Island Agricultural Experiment Station.

While the work to date has not completely resolved the problem of DDT resistance on the part of the potato flea beetle, it has turned up several important results, some of which are not related to the problem of resistance.

For example, aphids were found to be definitely more injurious to and have a greater effect on the yield of potatoes than does the potato flea beetle. Another result is that dieldrin at a low rate of application is an outstanding insecticide for control of the potato flea beetle, and its residues are insecticidally effective on the potato foliage for a relatively long period of time.

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Crag Herbicide for Peanuts

Georgia peanut-growing tests show distinct advantages are gained by using a pre-emergence herbicide on bedded rows of peanuts, according to Dr. Lytton W. Boyle and Dr. R. O. Hammons in a recent Georgia Experiment Station bulletin.

Sesone, formerly called Herbicide-1, was used in the Georgia tests at the rate of three pounds per acre. This herbicide is one of the Crag agricultural chemicals of Union Carbide Chemicals Company, a Division of Union Carbide Corporation.

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Bordeaux Vs. Spanish Moss

In many sections of Louisiana pecan trees that are not sprayed regularly may be seriously damaged by Spanish moss which shades the trees and retards growth.

Spanish moss can best be killed by spraying trees with a 10-2-100 Bordeaux mixture before growth begins in the spring. During the growing season, in June or July, use a 6-2-100 mixture. This mixture contains six pounds of copper sulfur, two pounds of lime, and 100 gallons of water and controls leaf diseases as well as Spanish moss.

•

Emcol H-C for F-P Mixtures

An improvement in facilitating field mixing of emulsifiable pesticide concentrates with liquid fertilizers has been announced by Emulsol Chemical Corp., Chicago.

The new emulsifier, Emcol H-C is an extension of Emcols H-A and H-B which have been in production for some time, for such emulsifiable concentrates as aldrin, BHC, chlordane, dieldrin, endrin, heptachlor and nemagon. This new material, Emcol H-C, is especially recommended in formulating emulsifiable concentrates to be used in high potash fertilizer solutions.

•

Sources of N For Sugarcane

The Agricultural Experiment Station of Mississippi State College, State College, Miss., has issued a booklet titled, "Sources of Nitrogen for Sugarcane Production."

LITERATURE AVAILABLE

The following list reviews a series of bulletins on fertilizer, insecticide, and fungicide recommendations, controls, etc. Unless otherwise stated, all bulletins may be obtained from the University of Puerto Rico, Agricultural Experiment Station, Rio Piedras, P. R.

"Mineral-Deficiency Symptoms Displayed by Coffee Trees Grown Under Controlled Conditions," by Hector Cibes and George Samuels. This booklet contains the results of a study of deficiency symptoms on coffee trees caused by lack of major and minor elements. Elements studied were nitrogen, phosphorus, potassium, calcium, sulfur, magnesium, iron, manganese, and boron. Technical Paper 14, Aug. 1955.

"Mineral-Deficiency Symptoms Displayed by Acerola Trees Grown in the Greenhouse Under Controlled Conditions," by Hector Cibes and George Samuels. A report on work performed to discover not only the visual symptoms of nutrient deficiencies resulting from the absence of major and minor elements, but also such factors as the parts of the plant which best show these symptoms both visually and chemically, relative growth made under the various deficiencies, and the influence of such deficiencies on yields. Technical Paper 15, Aug. 1955.

"Research With Sugarcane Fertilizers in Puerto Rico, 1910-1954," by George Samuels and Bernardo G. Capo. This 104-page booklet is a summary of the research work which has been carried out on the island since 1919 to determine the proper fertilizer practices. Some details of the Agricultural Experiment Station's history and evolution are also presented. Technical Paper 16, March, 1956.

"El Cultivo Del Algodon En Puerto Rico," by Juan Pastor Rodriguez and Luis F. Martorell. (In Spanish) A review of the history and prospects for cotton-growing in Puerto Rico. Bulletin 131, Feb. 1956.

"Estudio Sobre La Explotacion Economica De 134 Fincas De Cana De Azucar Puerto Rico," by Manuel Pinero and Juan R. Calderon. (In Spanish) The results of a study taken to provide both the farmers and the government with reliable information regarding the organization, operation, and management of sugarcane farms in Puerto Rico. Bulletin 132, April 1956.

"Analisis Economico Del Cultivo Del Tabaco En Puerto Rico," by Gabriel R. Espinet. (In Spanish) The information for this study was obtained from 150 tobacco farms in the East Central Region of Puerto Rico. The survey was for the year 1951-52. Bulletin 133, April 1956.

"La Produccion Comercial Del Maiz En Puerto Rico," by A. Eschenwald, C. Ortiz Lugo, and A. Gonzalez Chapel. (In Spanish) Recommendations given in this bulletin in regard to land preparation, planting, control of weeds and insects, harvesting, and use of machinery and equipment in field trials on a commercial scale performed at the Lajas Agricultural Experiment Substation during the past few years. Bulletin 134, Sept. 1956.

•

Dalapon For Weed Control

The results of a study on the control of quackgrass with dalapon, conducted by K. P. Buchholtz and D. R. Peterson of the University of Wisconsin, Madison, are contained in the spring issue of *Down To Earth*, published by the Dow Chemical Co., Midland, Mich.

Truck Crop Pest Control

The State College of Washington, Pullman, Wash., has issued a control program for insects and other pests of truck crops for commercial growers.

The 16-page mimeographed folder contains information on equipment for applying insecticides and the established tolerances on each vegetable for the major pesticides. Individual recommendations are listed for the general pests of Washington crops.

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WASHINGTON REPORT

By Donald Lerch

HOW big is the roadside market for agricultural chemicals? This is a question both the fertilizer and pesticide industries are trying to answer. Both groups appear to have made some progress.

Latest move by the pesticide industry is a decision to prepare basic informational material for highway engineers and others who make the decisions on planting and maintenance of roadsides. This material would be brought to the attention of this key influence group through trade magazines regularly read by these highway people.

At present, expenditures for herbicides are the number one item in pest control, with dollar investment in insecticides much less. Aim of the current move is to greatly multiply expenditures in both these fields.

During a recent meeting in Washington, Dr. Richard P. White, executive vice president, American Association of Nurserymen Inc., observed that "too much effort by the agricultural chemical people has been made to sell chemicals rather than to sell highway safety and highway pleasure and acceptance." Perhaps it's time for the agricultural chemical industry to take a look at the highway problem from the users' point of view, rather than from the chemical side.

* * * * *

Not often is the U. S. Department of Agriculture forced into the position of putting out a series of press releases justifying a major action, such as a spray program. Because of the vigorous opposition of what Washington feels is the "organic gardening group," plus a few other vocal sympathizers, the Department has been forced to put out a series of releases stating that the gypsy-moth spray program does not cause major damage among honeybees, and that natural enemies cannot control the pest. The effort made by the Department to justify its action is indicative of the impact the attack, carried largely in newspapers, has made upon Department officials. Actually, the spray campaign is ended. The second part is just beginning. It consists of laying traps to determine the success of the spray program. This trapping will continue on into early fall.

Significantly, the U. S. Department of Agriculture made a major effort to get information about the gypsy moth control program before the public in advance of the actual spray operations. Evidence in the hands of this reporter to date is that no major damage has occurred with the exception of one major kill of fish, caused by pilot error. There are several other instances where fish were killed, but the damage was not of major proportions, according to Department officials.

Despite this favorable early report of little significant damage, there continues to be quite a lot of "noise."

There is some thought in Washington that in the future, before major spray campaigns are launched, the Secretary of Agriculture or one of the Assistant Secretaries should call a meeting in the major cities in the control area, to which editorial writers and key newspaper personnel would be invited along with representatives from radio and television. The purpose of the meeting would be to impress upon the mass media the importance of accurate reporting of the control program. The Secretary would then introduce a "team of scientists" who would review, in brief, the technical aspects of the control program. This would give the preliminary information campaign a greater degree of importance, and might serve to squelch some of the scare stories which often follow later.

At this writing, Washington is concerned about the gypsy moth campaign to the extent that it is reviewing alternate plans of operation so that there will be no repeat performance.

* * * * *

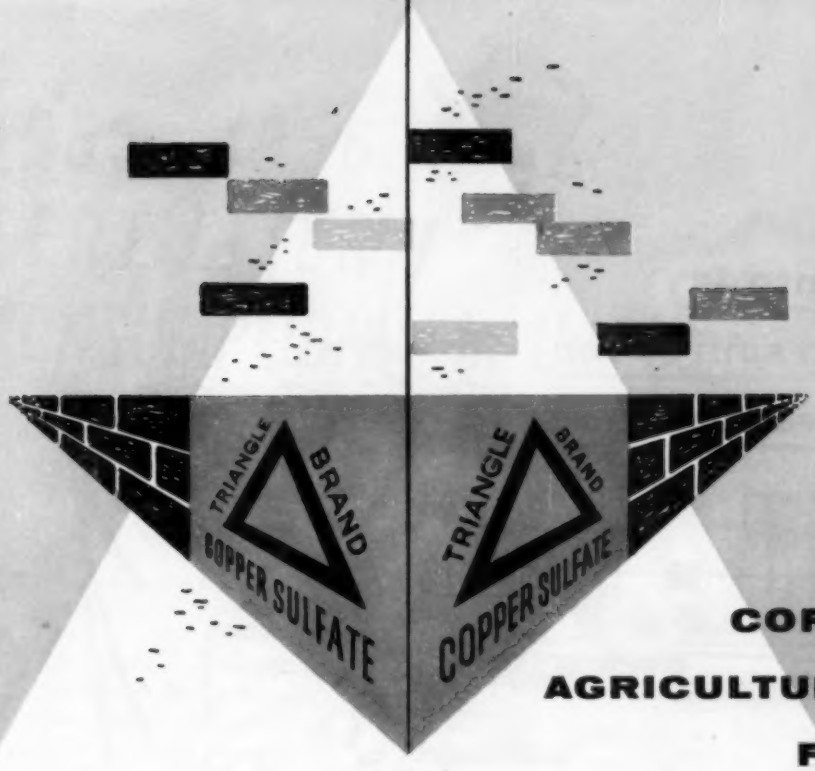
Washington gives another nod of approval and applause on the appointment of Dr. Charles E. Palm as Director of the Cornell University Agricultural Extension Station, and Director of Research for the New York State Colleges of Agriculture and Home Economics. Charlie Palm's name is frequently referred to in discussions on agricultural chemicals. He is well liked and respected, and his new position of responsibility at Cornell emphasizes that he is one of the nation's leaders in this field.

* * * * *

National Agricultural Chemicals Association continues its activity in the field of foreign affairs through the Foreign Trade Committee, which recently held a reception and buffet dinner for government representatives and agricultural attachés. Prominent in attendance were officials of the Pan American Sanitary Bureau, the International Cooperation Administration, U. S. Department of Agriculture, and the Public Health Service.

The latest meeting was especially well-attended by industry representatives. There's little doubt of the growing interest among U. S. companies in the overseas market.

(*Continued on Page* 98)



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WHERE CREATIVE CHEMISTRY WORKS WONDERS FOR YOU

1955 - 1956 FERTILIZER CONSUMPTION in the U. S.

By Walter Scholl, Hilda M. Wallace, Esther I. Fox, & Florence B. Crammatte

Fertilizer and Agricultural Lime Section
Soil and Water Conservation Research Branch
Agricultural Research Service
U. S. Department of Agriculture
Beltsville, Maryland

THE consumption of fertilizers in the U. S. and Territories (Hawaii and Puerto Rico) in the year ended June 30, 1956, amounted to 22,193,070 tons. This was a decrease of 533,392 tons from the quantity (22,726,462 tons) used in the preceding year. The 1955-56 consumption of fertilizers comprised 21,403,465 tons of products containing one or more of the primary plant nutrients (N, P_2O_5, K_2O), and 789,605 tons of the secondary and trace nutrient materials which did not contain these nutrients. The quantity of products containing primary nutrients was 531,391 tons (2.42 percent) below the (21,934,856 tons) in 1954-55. The consumption of materials that did not contain primary nutrients was 2,001 tons (0.25 percent) below the quantity (791,606 tons) used in the preceding year.

Fertilizers used in 1955-56 contained 6,054,741 tons of nitrogen, available P_2O_5, and K_2O, or 64,398 tons (1.05 percent) less than in 1954-55. This was the first time in 17 consecutive years that the total consumption of primary nutrients failed to increase. The use of nitrogen decreased 27,933 tons (1.42 percent) to 1,932,603 tons, that of available P_2O_5 36,240 tons (1.59 percent) to 2,247,420 tons, and that of K_2O 225 tons (0.01 percent) to 1,874,718 tons. The amount of total P_2O_5 increased 46,699 tons (1.80 percent) to 2,643,418 tons, owing principally to the increase in the direct use of phosphate rock which is estimated to have contained an average of 32 percent of total P_2O_5 but only 3 percent of available P_2O_5.

In 1955-56 the average primary nutrient content of fertilizers bearing primary nutrients was 28.29 percent as compared with 27.90 percent in 1954-55.

The data presented herein were compiled from manufacturers' reports of shipments to agents, dealers, distributors, and consumers in the Territories (except Alaska), the District of Columbia, and the States (except California, Florida, Massachusetts, Missouri, North Carolina, South Carolina, and Texas). For the latter seven States the data were compiled chiefly from the reports of the respective fertilizer control officials. No data were available for Alaska. Supplementary information was furnished by the control offices and other State agencies, as well as by fertilizer brokers, and special inquiries were made of all known distributors and custom applicators of anhydrous ammonia and nitrogen solutions.

The quantities are reported as 2,000-pound tons. Although the data refer to shipments, the terms "consumption," "sales," and "shipments" are used synonymously. The actual consumption differs slightly, no doubt, from either the shipments or sales.

All Fertilizers

THE consumption of the two classes of fertilizers (mixtures and materials) is summarized by States and Regions in table 1. In only two regions—the West South Central and Pacific—were slight gains made, while in the other regions consumption was lower by amounts ranging up to nearly 11 percent as compared with the preceding year (table 1a). In 1955-56 approximately 64 percent of the decrease in fertilizer tonnage occurred in the three Atlantic coast regions. Among the other areas the West North Central region accounted for the highest proportion (22.5 percent) of the decrease.

In Hawaii and in each of 16 States scattered through every region, the consumption of fertilizers was higher in 1955-56 than in the preceding year. These units, which in 1955-56 accounted for 35.52 percent of the United States consumption of fertilizer, showed a total gain of 587,222 tons (7.45 percent) over their consumption in 1954-55.

Compared with the tonnages in each six-month period of 1954-55, most of the decrease in total consumption of fertilizers occurred in the January-June period of 1955-56. Consumption in this period was 461,424 tons (2.78 percent) lower, while in the July-December period consumption was 71,968 tons (1.17 percent) lower.

In table 1, the percentage change in consumption of fertilizers in 1955-56 from the level in 1954-55 is based on the tonnage of primary nutrient containing fertilizers only, in order that a direct comparison may be made with the percentage change in the quantities of the primary nutrient themselves.

Table 1. - Consumption of fertilizers, year ended June 30, 1956 1/

State and Region	Mixtures			Materials 2/			Grand total	Compared with year ended June 30, 1955	
	July 1 - Dec. 31, 1955	Jan. 1 - June 30, 1956	Total	July 1 - Dec. 31, 1955	Jan. 1 - June 30, 1956	Total		Fertilizers 3/	Total N, avail. P_2O_5 & K_2O
	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Percent	Percent
Maine	10,654	167,361	178,015	1,496	3,896	5,352	183,367	101	103
New Hampshire	1,622	10,553	12,175	1,317	2,835	4,152	16,327	89	89
Vermont	1,098	29,458	30,556	10,375	7,768	18,143	50,699	104	106
Massachusetts	9,350	49,158	58,508	4,340	11,426	15,766	74,274	87	86
Rhode Island	1,412	11,709	13,121	334	1,431	1,765	14,906	90	87
Connecticut	6,845	46,150	53,195	4,421	19,068	23,489	76,684	87	91
New England	30,981	314,389	345,570	22,263	46,424	68,687	416,257	95	98
New York	111,267	381,250	492,517	26,435	54,953	81,408	573,925	91	93
New Jersey	43,806	195,197	239,163	6,429	16,713	23,140	262,303	92	94
Pennsylvania	170,254	414,943	585,237	21,699	45,625	67,324	652,561	92	95
Delaware	12,921	67,730	80,651	1,034	3,692	4,726	85,377	89	93
District of Columbia	449	1,326	1,775	297	469	766	2,541	90	92
Maryland	66,983	198,673	265,656	5,475	10,270	15,745	281,401	88	89
West Virginia	16,167	58,718	74,885	1,238	6,712	10,004	84,889	104	104
Middle Atlantic	421,847	1,317,997	1,739,804	64,681	138,432	203,113	1,942,997	92	94
Virginia	150,983	521,580	672,563	20,675	84,626	105,301	777,864	96	97
North Carolina	800,189	1,150,965	1,351,154	49,003	301,261	350,264	1,701,418	92	90
South Carolina	89,212	525,991	615,203	30,865	218,022	248,887	864,090	93	97
Georgia	178,973	820,141	999,114	54,816	217,126	271,942	1,271,056	89	93
Florida	305,782	695,672	1,001,461	54,038	81,480	137,518	1,138,979	109	109
South Atlantic	1,525,146	3,714,349	4,839,495	209,397	904,515	1,113,912	5,953,407	97	99
Ohio	293,150	692,167	985,317	16,588	48,226	64,814	1,050,131	97	97
Indiana	229,030	691,973	921,003	26,408	116,572	142,980	1,063,983	92	97
Illinois	146,542	368,395	514,937	365,146	480,375	845,521	1,360,458	112	96
Michigan	172,897	405,834	578,731	13,006	36,261	49,267	627,998	98	103
Wisconsin	65,262	314,619	379,881	9,871	22,582	32,453	412,274	96	102
East North Central	906,861	2,472,988	3,379,849	431,039	703,996	1,134,995	4,514,844	100	99
Minnesota	47,788	241,535	289,323	15,469	63,316	78,785	368,108	98	102
Iowa	82,805	223,038	305,843	49,143	94,320	143,463	449,306	77	77
Missouri	180,880	273,888	454,768	179,345	176,296	355,641	810,409	119	105
North Dakota	2,866	20,992	23,858	7,981	37,329	45,310	69,168	110	115
South Dakota	1,737	7,684	9,421	4,210	12,969	17,179	26,600	70	76
Nebraska	3,708	16,802	20,510	22,196	90,284	112,480	132,990	64	79
Kansas	48,309	29,565	78,074	68,113	61,557	129,670	207,744	89	91
West North Central	369,293	813,504	1,181,797	366,457	536,071	882,528	2,064,325	94	92
Kentucky	61,565	370,689	432,254	28,078	74,807	102,881	535,135	102	105
Tennessee	88,799	321,409	410,208	29,888	76,043	105,931	516,139	97	103
Alabama	126,327	679,496	805,823	69,162	223,909	293,071	1,098,894	95	99
Mississippi	19,648	312,768	332,416	173,589	242,217	417,806	750,222	104	105
East South Central	296,339	1,684,362	1,980,701	302,713	616,976	919,689	2,900,390	99	101
Arkansas	29,879	145,352	175,231	29,882	158,206	188,088	363,319	109	117
Louisiana	89,902	133,602	163,524	34,108	105,853	139,961	303,485	95	100
Oklahoma	34,604	41,908	76,532	34,912	24,060	58,972	135,504	107	110
Texas	87,671	200,131	287,802	106,122	172,579	278,701	566,503	96	107
West South Central	182,076	521,013	701,089	205,024	460,698	665,722	1,368,811	100	108
Montana	903	2,834	3,737	10,010	19,221	29,231	329,968	137	135
Idaho	426	4,956	5,382	14,846	44,191	59,037	64,419	57	70
Wyoming	66	1,773	1,839	1,078	8,062	9,140	10,979	100	98
Colorado	2,752	9,289	12,041	8,400	33,109	41,509	53,550	111	112
New Mexico	314	1,517	1,831	5,169	21,990	27,159	28,990	89	92
Arizona	3,788	13,685	17,473	53,562	82,529	136,091	153,564	94	103
Utah	576	3,950	4,526	3,359	23,099	26,458	30,984	111	117
Nevada	477	570	1,047	1,152	2,081	3,233	4,282	176	166
Mountain	9,302	38,574	47,876	97,576	234,284	331,860	379,736	90	99
Washington	6,052	29,902	35,954	47,423	86,462	133,885	169,839	85	90
Idaho	4,550	21,900	26,450	30,099	113,394	143,493	169,943	89	100
Oregon	4,596	19,859	24,455	20,729	54,893	75,622	100,077	107	110
California	85,351	161,143	246,494	621,527	975,582	1,597,109	1,931,603	104	106
Pacific	95,953	212,845	308,898	769,049	1,175,431	1,944,687	2,251,385	104	106
Continental U. S.	3,438,838	11,090,321	14,529,159	2,448,199	4,816,794	7,264,993	21,794,152	98	99
Hawaii	34,782	30,603	65,385	40,941	59,758	100,699	166,084	106	107
Puerto Rico	72,293	108,816	181,109	19,498	32,227	51,725	232,834	82	84
Alaska 4/	---	---	---	---	---	---	---	---	---
Territories	107,075	139,419	246,494	60,439	91,985	152,424	398,918	90	93
Total: 1955-56	3,545,913	11,229,740	14,775,653	5/ 2,508,638	4,908,779	7,417,417	22,193,070	98	99
1954-55	3,621,898	11,725,992	15,347,890	5/ 2,504,621	6/ 4,873,991	7,378,612	22,726,502	100	100
1953-54	3,370,022	12,171,054	15,541,076	2,603,399	4,629,024	7,232,423	22,773,499	101	99

1/ Includes: Ground phosphate rock, basic slag, secondary and trace nutrient materials, such as, borax, sulfur, magnesium sulfate, etc., used as separate materials, also fertilizers distributed by Government agencies. Does not include liming materials, but includes gypsum. 2/ Does not include the quantities of materials used for manufacture of commercial mixtures. 3/ Fertilizers which were guaranteed to contain one or more of the primary plant nutrients (N, P_2O_5, K_2O). 4/ Data not available - estimated less than 1500 tons. 5/ Revised by deletion of 737 tons of basic slag from Pennsylvania total and addition of 6,426 tons of gypsum to North Carolina total. 6/ Revised by deletion of 7,804 tons of basic slag from Pennsylvania total and addition of 4,872 tons of gypsum to North Carolina total.

Table 2. - Consumption of principal mixed fertilizers in the Continental United States, by grades, years ended June 30, 1955 and 1956

Grade	Consumption 1/		Proportion of total	
	1955	1956	1955	1956
	Tons	Tons	Percent	Percent
0-8-24	5,115	5,580	0.03	0.03
0-9-27	16,885	11,816	.11	.08
0-10-10	2,965	3,597	.02	.03
0-10-20	55,695	62,640	.37	.43
0-10-30	45,605	41,660	.30	.29
0-12-12	20,720	20,064	.13	.13
0-12-20	11,983	16,373	.08	.12
0-12-36	7,491	10,707	.05	.07
0-14-10	5,108	3,394	.04	.02
0-14-14	189,982	174,442	.86	1.21
0-15-30	16,380	15,256	.11	.10
0-15-45	3,154	4,879	.02	.03
0-16-8	25,190	46,697	.17	.33
0-20-10	16,079	11,135	.10	.07
0-20-20	341,795	310,275	2.27	2.14
0-24-24	7,502	8,912	.05	.06
0-25-25	10,133	17,837	.07	.12
0-30-15	9,255	11,587	.06	.08
0-30-30	18,623	20,284	.13	.15
0-40-8	6,173	4,150	.04	.03
2-12-6	44,191	27,156	.29	.18
2-12-12	438,393	400,811	2.91	2.76
3-6-6	12,084	9,173	.08	.06
3-9-6	458,506	367,517	3.28	2.53
3-9-9	458,438	478,161	3.28	3.29
3-9-18	28,624	33,474	.19	.24
3-9-15	11,291	8,400	.08	.05
3-9-18	80,324	70,990	.53	.49
3-9-27	109,446	95,000	.73	.66
3-12-6	210,639	152,357	1.40	1.04
3-12-12	1,413,525	1,371,479	9.38	9.47
3-18-9	50,074	41,699	.33	.28
4-4-2	3,013	5,050	.02	.04
4-6-6	11,965	8,503	.08	.06
4-6-8	43,472	38,981	.29	.27
4-7-5	117,706	115,248	.78	.79
4-8-4	12,799	11,311	.08	.08
4-8-6	248,738	190,357	1.65	1.31
4-8-8	280,857	219,903	1.87	1.51
4-8-10	97,506	115,008	.64	.79
4-8-12	56,399	53,139	.38	.37
4-9-3	69,566	61,442	.46	.43
4-10-6	428,671	366,797	2.82	2.54
4-10-7	640,994	469,543	4.25	3.23
4-10-8	2,365	3,071	.02	.03
4-10-10	8,649	10,657	.06	.07
4-12-4	104,024	84,300	.69	.58
4-12-8	149,971	146,648	.99	1.01
4-12-12	901,698	737,215	5.33	5.07
4-12-16	3,514	3,071	.03	.02
4-16-8	30,901	23,225	.20	.16
4-16-16	709,756	615,596	4.66	4.24
4-24-12	38,088	24,865	.26	.17
5-3-6	3,802	3,559	.02	.03
5-5-5	6,918	3,781	.05	.02
5-5-8	6,551	7,085	.04	.05
5-6-6	3,535	3,719	.03	.02
5-6-8	12,764	9,399	.08	.07
5-7-5	21,400	22,008	.14	.15
5-8-5	1,641	3,964	.01	.03
5-8-7	14,111	10,294	.10	.07
5-8-8	3,653	5,307	.02	.03
5-10-5	764,044	678,083	5.07	4.67
5-10-10	1,379,753	1,296,912	9.16	8.93
5-10-15	111,158	128,086	.74	.88
5-10-20	8,761	8,589	.06	.06
5-10-30	377	3,317	(g/)	.02
5-15-10	7,718	3,980	.05	.03
5-15-15	18,010	6,009	.12	.04
5-15-30	5,310	6,298	.03	.04
5-20-10	55,880	58,433	.37	.41
5-20-20	584,263	699,511	3.75	4.81
5-40-0	0	5,966	0	.04
6-3-6	23,413	14,094	.15	.10
6-4-6	15,292	19,139	.11	.13
6-4-8	38,744	43,944	.25	.30
6-4-12	924	3,963	.01	.03
6-6-6	77,090	85,327	.51	.59
6-6-8	16,469	31,430	.11	.21
6-6-12	11,492	9,934	.08	.07
6-6-18	13,616	11,070	.09	.08
6-7-7	4,757	4,126	.03	.03
6-8-2	2,938	5,281	.02	.03
6-8-4	123,438	104,043	.82	.72
6-8-6	159,826	123,735	1.06	.85
6-8-8	264,902	256,288	1.76	1.85
6-8-12	23,125	24,559	.15	.17
6-9-3	5,708	5,280	.04	.03
6-9-6	8,983	8,802	.06	.06
6-9-9	6,329	3,601	.04	.03
6-9-10	0	4,094	0	.03
6-9-12	51,069	36,971	.34	.25
6-10-4	71,995	77,937	.48	.54
6-10-6	3,629	5,813	.02	.04
6-12-4	3,278	3,943	.02	.02
6-12-6	51,496	41,708	.34	.29
6-12-12	280,571	334,595	1.86	2.30
6-12-15	2,212	3,360	.02	.03
6-12-18	2,516	6,010	.02	.04
6-18-6	588	3,015	(g/)	.02
6-18-10	2,491	8,834	.02	.07
6-20-20	4,501	4,499	.03	.03
6-24-0	13,397	7,909	.09	.05
6-24-12	65,377	84,454	.43	.58
6-24-20	22,433	44,673	.15	.31
7-7-7	29,851	24,707	.20	.17
7-8-5	5,705	7,705	.03	.05
7-9-9	3,366	3,737	.03	.03
7-14-7	2,733	3,902	.01	.03
8-8-8	16,007	12,278	.11	.08
8-8-12	6,465	5,820	.04	.04
8-8-24	20,395	21,111	.14	.15
8-3-6	1,580	12,258	.01	.08
8-4-6	2,108	6,150	.01	.04
8-4-8	41,629	37,168	.28	.26
8-6-4	5,610	6,900	.04	.05
8-6-6	4,159	4,004	.02	.02
8-6-8	3,721	20,456	.03	.14
8-8-4	19,033	16,218	.13	.12
8-8-8	226,634	207,987	1.50	1.43
8-9-10	7,641	8,164	.05	.06
8-10-10	11,976	11,169	.08	.07
8-12-12	39,478	55,748	.26	.39
8-12-16	17,501	16,119	.12	.11
8-16-8	5,860	6,189	.04	.04
8-16-16	126,175	140,341	.83	.97
8-24-0	2,624	5,479	.02	.03
8-24-8	85,837	72,908	.57	.51
8-24-12	9,818	13,576	.06	.09
8-32-0	61,110	60,377	.40	.42
9-6-6	10,069	10,609	.07	.07
9-9-9	3,879	10,906	.03	.07
9-36-0	1,324	3,006	.02	.02
10-8-8	2,204	4,020	.01	.03
10-10-10	29,688	28,687	.20	.18
10-10-12	4,714	3,788	.03	.02
10-10-20	1,010	5,504	.01	.04
10-14-10	3,753	4,808	.02	.03
10-5-5	3,087	3,657	.02	.03
10-6-4	40,540	48,175	.27	.29
10-10-8	8,703	8,845	.06	.06
10-10-5	23,529	22,569	.16	.15
10-10-10	725,133	698,090	4.81	4.59
10-15-15	4,824	6,108	.03	.04
10-16-8	7,661	8,274	.05	.06
10-20-0	102,526	61,825	.68	.44
10-20-10	86,642	122,165	.58	.83
10-20-20	15,143	23,540	.10	.16
10-30-10	5,211	4,584	.03	.04
11-48-4	3,131	4,891	.02	.03
12-0-10	19,820	13,570	.13	.09
12-0-12	5,965	7,832	.04	.06
12-6-6	5,683	7,150	.04	.05
12-12-12	306,898	280,838	2.04	1.94
12-24-12	27,327	26,762	.18	.19
12-36-12	4,750	4,729	.01	.03
12-24-0	8,272	4,597	.06	.03
13-13-13	31,459	38,052	.20	.26
14-0-7	0	11,641	0	.08
14-0-14	46,804	47,436	.31	.33
14-14-14	33,780	43,913	.23	.30
15-0-12	3,549	3,181	.02	.02
15-0-15	4,043	4,902	.03	.04
15-8-4	6,731	7,815	.04	.05
15-15-0	55,637	31,462	.37	.22
15-30-0	2,958	4,174	.02	.03
16-8-8	3,313	3,958	.02	.02
16-16-0	7,775	4,996	.06	.03
16-48-0	236	5,090	(g/)	.04
17-7-0	17,813	16,192	.12	.11
20-0-20	7,399	6,417	.05	.04
171 listed grades	14,504,643	13,973,348	96.26	96.17
Other grades reported	3/ 435,397	4/ 350,045	2.88	2.46
Not reported by grade	128,147	197,796	0.86	1.37
Total	5/ 15,068,187	5/ 14,529,159	100.00	100.00

1/ Grades consumed in amounts of 3,000 tons or more in year ended June 30, 1956 and their consumption in year ended June 30, 1955. 2/ Less than 0.005 percent. 3/ 1,171 grades. 4/ 1,231 grades. 5/ Does not include the quantity of mixtures consumed in the Territories.

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Mixtures

IN 1955-56 the total consumption of commercial mixed fertilizers amounted to 14,775,653 tons, or 66.58 percent of the quantity of fertilizers. There were 1,536 grades reported. In addition, approximately 500 mixtures, not reported by grades, were used in California and the quantities of an unknown number reported by manufacturers in other States.

The total consumption of mixed fertilizers in 1955-56 was 572,197 tons (3.73 percent) less than in the preceding year (table 1a), and the quantity decreased in each of the regions except the Pacific which showed an increase of 3.78 percent.

In the Continental United States, there were 171 grades consumed in individual amounts of 3,000 tons or more (table 2). These totaled 13,973,318 tons and accounted for 96.17 percent of the quantity of mixtures used on the Continent. Other grades consumed in this area numbered 1,231 and amounted to 358,045 tons (2.46 percent). The balance (197,796 tons, 1.37 percent) represented mixtures not reported by grades.

Consumption of mixtures in Hawaii and Puerto Rico amounted to 246,494 tons in 168 grades. While many of the grades in Puerto Rico are similar to those used on the Continent, most of those in Hawaii are designated in fractional numbers.

In 1955-56, four ratios of the primary nutrients (N: available P_2O_5: K_2O) accounted for 50.63 percent of the total consumption of mixed fertilizers in the Continental United States (table 2a). Individually, the proportions were 17.42, 13.88, 10.86, and 8.47 percent for the 1:4:4, 1:2:2, 1:1:1, and 1:3:3 ratios, respectively.

Table 2a.

Ratios of primary nutrients of mixed fertilizers consumed in largest tonnage in the Continental U. S., year ended June 30, 1956.

Nutrient ratio[1]	Consumption	Proportion of quantity of all mixed fertilizers
	tons	percent
1:4:4	2,531,259	17.42
1:2:2	2,017,105	13.88
1:1:1:	1,578,374	10.86
1:3:3	1,230,328	8.47
Total	7,457,066	50.63

1 N:available P_2O_5:K_2O.

The 15 grades consumed in largest tonnages in 1955-56 in each of the Continental regions and Puerto Rico are shown in table 3, together with the quantities for each State in the region. Excepting California, Colorado, Washington, Wyoming, and the District of Columbia, these grades accounted for 50 percent or more of the total consumption of mixtures in each of the States and Puerto Rico. At least 12 of the grades were among the 15 consumed in largest tonnages in each of the areas in the preceding year, but

not always in the same order of tonnage.

Though 171 grades consumed in the Continental U. S. represented 96.17 percent of the total tonnage of mixed fertilizers used in this area, 15 of these (table 3) accounted for 62.56 percent of the tonnage. These 15 were the same as those in 1954-55 except that the 6-12-12 grade replaced the 4-8-8 grade. The weighted average guaranteed nutrient content of the 15 grades was 4.80 percent nitrogen, 12.12 percent available P_2O_5, and 11.30 percent K_2O (total, 28.22 percent) as compared, respectively, with 4.51, 11.80, and 10.86 percent (total, 27.17 percent) in the preceding year. The proportionate increases in the concentration of nitrogen and potash were higher than in that of P_2O_5.

In 1955-56 the 5-10-10 grade was consumed in largest tonnage, while in each of the preceding 6 years the 3-12-12 grade showed the largest consumption.

The consumption of mixtures by classes (N-P-K, N-P, P-K, N-K) for each region and the United States is shown in table 5. Except for the Mountain region, N-P-K mixtures were used in much larger quantities than the other classes. More than 80 percent of the tonnage of all mixtures consumed in each of the other regions was of this class, while in the Mountain region the tonnages of N-P-K and N-P mixtures were nearly equal. In 1955-56 for the United States and Territories, 90.80 percent of the tonnage of all mixtures was of the N-P-K class, while for the other classes — N-P, P-K, N-K — consumption was 1.96 percent, 5.73 percent, and 1.51 percent of the total tonnage, respectively. The proportions were only slightly different in 1954-55.

The average primary nutrient content of all mixtures consumed in each State and Territory is shown in table 7. Compared with 1954-55 the averages for the 51 political units in 1955-56 showed for nitrogen, increases in 38 and decreases in 13; for available P_2O_5, increases or no change in 42 and decreases in 9; for K_2O, increases in 41 and decreases in 10; and for all these nutrients, increases in 44 and decreases in 7. The West South Central region was the only area where, in each of the political units the average content of each of the nutrients showed an increase.

The national weighted average of the primary nutrients contained in mixed fertilizers in 1955-56 was for nitrogen, 5.39 percent; for available P_2O_5, 12.08 percent; for K_2O, 11.20 percent; and for the total of these nutrients 28.67 percent. The corresponding values in the preceding year were 5.25, 11.86, 10.80, and 27.90 percent. The proportionate increase was highest for K_2O and lowest for P_2O_5.

Materials

IN 1955-56 the consumption of fertilizer materials for direct application amounted to 7,417,417 tons as compared with 7,378,612 tons in 1954-55 (table 1). Fertilizer materials in 1955-56 comprised chemical nitrogen materials, 3,271,952 tons; natural organic materials, 472,706 tons; phosphate materials (including ammonium phosphates, ammonium phosphate-sulfate, and ammonium phosphate-nitrate), 2,478,315 tons; potash materials

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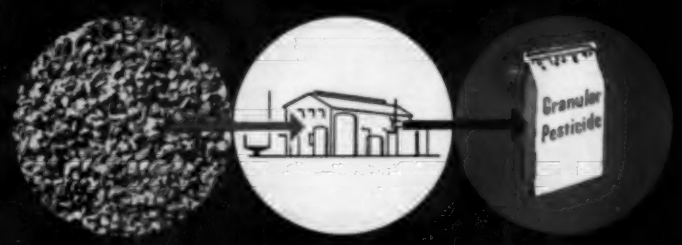

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(including potassium nitrate, potassium-sodium nitrate, and lime-potash), 404,839 tons; and secondary and trace nutrient materials, 789,605 tons. Compared with the previous year, there was an increase of 11,606 tons in natural organic materials, 253,660 tons in phosphate materials, and 3,755 tons in potash materials. Chemical nitrogen materials and secondary and trace nutrient materials decreased 228,215 tons and 2,001 tons, respectively. The consumption of the principal materials comprising these classes is shown by States and regions in tables 4 and 5.

Compared with the previous year, the principal changes in consumption of the chemical nitrogen materials in 1955-56 were increases in the tonnage of urea (35 percent), aqua ammonia (34 percent), and anhydrous ammonia (18 percent). The largest increases in the tonnages of urea were in the East North Central, West South Central, Mountain, and Pacific regions, which together accounted for 73 percent of the consumption of this material in 1955-56. Most of the increase in consumption of aqua ammonia was in the Pacific region where 77 percent of the total tonnage was used. Increases in the consumption of anhydrous ammonia were mostly in the South Central and Pacific regions—53,123 tons, 27.5 percent.

Decreases in the consumption of chemical nitrogen materials comprised chiefly sodium nitrate (73,038 tons, 12 percent), ammonium nitrate-limestone mix-

Table 3. - Consumption of mixed fertilizers, by grades in each State and Region, year ended June 30, 1956

State	Fifteen principal grades consumed in region, Tons															All other grades: Number 1/	All other grades: Tons 2/	Total tons
New England																		
	4-12-12	5-10-10	6-9-12	10-10-10	8-16-16	8-12-16	0-20-20	6-1-6	5-8-7	8-9-10	7-7-7	10-15-15	0-15-30	6-10-4	5-10-5			
Maine	51,077	12,795	35,886	11,243	12,130	16,071	745	0	2,134	8,164	475	6,048	93	323	224	40	13,607	178,815
New Hampshire	395	2,588	8	1,850	3,436	0	383	15	686	0	498	0	1,015	542	188	27	955	12,175
Vermont	187	6,187	0	3,434	5,917	0	18,293	0	129	0	134	0	2,064	70	187	26	1,774	38,396
Massachusetts	847	14,057	0	7,302	4,450	0	596	4,536	4,518	0	3,344	0	960	2,875	2,199	33	12,824	58,508
Rhode Island	298	7,111	0	585	185	0	372	0	581	0	134	0	153	642	195	29	2,606	13,126
Connecticut	1,401	10,072	0	5,611	2,220	0	1,246	5,021	2,844	0	2,165	0	1,695	1,265	2,061	61	13,051	51,192
Total	54,157	52,710	35,894	29,628	28,338	16,071	13,539	12,575	10,812	8,164	7,470	6,048	5,980	5,717	4,872	91	33,927	347,570
Middle Atlantic																		
	5-10-10	5-10-5	10-10-10	1-12-6	8-16-16	0-20-20	6-12-6	2-12-12	4-8-12	6-12-12	3-12-12	4-12-12	0-14-14	8-8-8	5-10-15			
New York	153,330	114,040	60,469	6,021	34,980	14,771	31,812	35	4,035	12,703	3,006	7	2,298	4,116	6,516	73	43,108	430,517
New Jersey	128,253	24,109	8,075	1,517	1,484	2,416	1,783	15	395	3,539	1,665	531	2,362	13,568	1,763	70	51,744	239,163
Pennsylvania	860,507	88,868	57,483	71,519	84,979	29,653	2,145	6,761	6,176	7,811	11,240	10,359	5,995	1,173	2,423	106	59,294	505,737
Delaware	38,581	1,899	6,661	1,239	1,598	1,817	0	4,037	1,081	1,376	1,734	1,213	2,951	263	5,936	60	7,751	80,651
District of Columbia	35	644	19	0	0	0	0	0	4	4	0	0	0	186	0	17	362	1,773
Maryland	68,887	84,031	15,397	36,861	4,163	5,359	6	16,261	14,931	1,720	9,680	5,110	5,520	1,676	1,611	86	34,395	265,636
West Virginia	33,183	2,688	3,102	11,315	256	5,436	0	2,790	1	362	772	151	2,859	13	82	46	11,340	75,985
Total	709,795	189,079	151,438	129,864	63,001	52,308	35,846	30,999	26,553	27,316	27,689	25,189	21,983	20,909	18,731	179	208,319	1,719,886
South Atlantic																		
	4-12-12	1-9-9	5-10-10	4-10-6	2-12-12	1-9-6	4-8-8	4-8-6	5-10-5	4-7-5	4-8-10	0-14-14	3-12-12	6-8-6	6-6-6			
Virginia	9,579	48,610	133,775	50	193,709	41,071	2	0	64,355	0	7,170	30,586	41	11,234	0	52	139,133	672,363
North Carolina	8,781	205,594	208,464	231,254	187,158	223,851	0	0	16,252	0	68,923	10,374	0	49,287	0	88	180,621	1,351,159
South Carolina	27,867	146,667	18,144	136,686	0	25,625	17,588	0	48,483	0	0	41,195	80,088	2,842	0	83	70,787	615,201
Georgia	514,081	74,563	7,684	47	19,668	1,502	111,203	149,744	4,845	99	0	2,459	2,187	15,139	0	97	99,607	999,114
Florida	68,871	7,369	5,642	774	4,731	0	77,699	40,448	6,924	115,151	38,872	6,315	3,177	7,647	84,906	837	777,082	1,201,964
Total	581,752	476,763	372,849	368,779	361,266	292,050	206,492	190,192	140,859	115,249	114,965	91,284	87,493	86,844	84,906	913	1,266,530	4,839,495
East North Central																		
	1-12-12	4-16-16	5-20-20	10-10-10	12-12-12	0-20-20	5-10-10	1-9-27	3-18-9	0-10-30	6-12-12	1-9-18	6-24-24	8-16-16	6-10-4			
Ohio	413,860	57,645	109,253	71,772	58,478	31,055	108,360	1,145	14,730	1,389	15,072	6,990	2,041	17,070	7,449	87	68,217	385,317
Indiana	171,610	259,650	143,896	98,771	76,252	44,089	3,836	23,720	5,317	10,998	5,015	2,620	9,095	2,383	3,187	103	67,666	501,001
Illinois	97,665	102,175	58,071	84,289	44,994	10,944	243	29,577	710	3,888	5,962	2,266	7,165	373	3,433	96	61,840	524,937
Michigan	136,799	109,209	182,644	40,149	77,861	17,989	4,186	1,380	19,812	3,866	9,830	1,450	0	1,008	6,837	81	48,344	574,731
Wisconsin	69,774	51,880	34,607	30,304	34,509	35,255	0	18,218	937	18,813	1,937	11,775	5,909	2,269	0	57	32,439	379,886
Total	889,608	580,559	528,471	325,216	292,254	146,281	116,825	75,060	41,634	38,980	37,916	27,195	24,211	23,794	20,906	179	278,708	2,366,072
West North Central																		
	12-12-12	5-20-20	6-24-12	1-12-12	8-24-8	10-10-10	0-20-20	5-20-10	8-32-0	4-12-4	4-16-16	10-30-0	8-8-8	13-13-0	8-16-16			
Minnesota	3,687	71,656	64,070	1,965	0	10,852	23,670	7,940	3,110	0	20,757	1,759	19	251	24,909	74	38,718	269,323
Iowa	28,402	89,644	4,366	18,714	601	28,759	9,601	60,240	13,277	64	9,737	15,112	19	7,008	2,119	204	51,130	339,881
Missouri	150,380	12,936	0	53,337	44,884	19,631	16,123	5	0	36,170	6,405	3,709	31,513	3,088	0	88	74,525	454,766
North Dakota	847	588	1,330	103	5	876	47	136	6,594	0	233	84	0	189	571	51	9,522	21,078
South Dakota	188	17	336	13	33	102	45	43	3,105	1	1	2,210	0	1,215	26	46	2,208	9,421
Nebraska	824	188	48	64	146	166	496	108	3,960	19	0	3,374	18	3,069	0	73	8,655	20,510
Kansas	1,044	506	7	833	31,208	364	435	0	3,011	4,932	117	11,455	490	8,003	58	95	19,871	81,071
Total	180,952	175,463	70,225	68,961	66,897	60,710	50,369	49,086	41,221	40,725	19,270	38,303	32,389	22,948	16,687	259	206,749	1,181,797
East South Central																		
	4-10-7	6-12-12	6-8-8	4-12-12	5-10-5	6-8-4	5-10-15	4-12-8	1-9-6	1-12-12	0-14-14	0-16-8	5-10-10	6-8-6	10-10-10			
Kentucky	0	17,753	41	159	1,907	0	84,369	84,951	17,409	50,449	917	0	21,579	30,833	22,766	71	98,911	432,254
Tennessee	1,524	218,712	2,941	2,101	3,973	1,334	12,134	7,320	58,041	16,449	248	0	8,266	883	3,734	99	72,484	410,208
Alabama	434,598	196	40,518	128,098	1,838	54,386	0	0	0	0	59,596	40,084	88	28	464	36	36,005	805,823
Mississippi	4,719	1,836	167,961	17	59,361	1,565	0	0	0	2,084	1,480	605	8,686	77	695	38	37,265	286,416
Total	440,841	238,477	211,461	130,373	107,079	57,285	96,503	92,271	75,450	68,982	* 57,173	40,631	38,553	31,821	27,359	143	244,755	1,930,701
West South Central																		
	5-10-5	10-20-10	8-8-8	12-12-12	1-12-12	4-12-4	6-8-12	12-24-12	10-20-0	13-13-13	6-8-6	5-20-20	3-9-18	5-10-10	0-20-20			
Arkansas	46,917	22,013	3,014	11,770	1,615	1,116	22,503	1,430	198	3,547	52	1,456	10,955	1,610	8,343	60	38,444	175,231
Louisiana	25,598	4,106	30,667	10,699	22,555	9,586	711	1,703	1	1,243	12,241	8,844	16	3,156	2,031	43	18,791	161,524
Oklahoma	27,355	17,542	479	385	545	4,703	0	2,934	7,096	331	0	346	1,050	2,147	61	45	11,570	76,510
Texas	118,233	51,698	15,384	3,797	3,881	7,836	178	18,329	11,886	6,138	113	2,134	11	1,286	791	88	18,397	287,892
Total	218,103	97,359	51,544	26,651	28,596	23,241	23,392	18,746	19,181	11,259	12,406	12,780	12,032	11,247	10,726	196	117,190	701,099
Mountain																		
	10-20-0	6-10-4	10-16-8	20-20-0	10-20-5	10-10-10	27-14-0	10-10-0	10-20-10	20-10-0	10-18-5	5-10-0	15-11-0	12-24-0	18-9-0			
Montana	2,186	199	0	0	0	0	80	0	8	0	204	615	0	0	0	21	505	3,737
Idaho	478	148	936	0	0	0	44	695	40	0	2	438	210	1,080	9	0	31	1,512	5,382
Wyoming	488	44	0	0	0	0	0	0	16	0	209	12	0	132	0	16	938	1,839
Colorado	479	894	1,601	48	0	0	395	0	865	76	386	205	0	836	0	70	6,714	12,041
New Mexico	135	0	0	0	0	0	76	0	19	0	0	0	0	0	0	10	884	1,124
Arizona	8,996	0	0	1,713	8,150	1,049	861	1,841	1,104	1,360	0	0	0	0	887	19	4,410	17,473
Utah	341	2,951	31	0	0	17	189	9	0	0	139	74	0	0	0	34	1,464	4,526
Nevada	87	725	0	0	0	33	40	0	0	0	0	0	0	0	0	9	169	1,063
Total	6,690	4,195	2,568	2,400	2,150	1,836	1,775	1,836	1,495	1,438	1,196	1,124	1,000	977	827	129	15,267	47,875
Pacific																		
	10-10-10	10-10-5	17-7-0	6-10-4	8-8-4	8-10-12	15-8-4	10-16-8	4-4-2	16-10-0	11-8-4	5-20-20	4-10-10	10-10-0	6-9-6			
Washington	838	197	0	3,086	0	0	0	231	0	0	0	1,642	0	19	0	77	10,049	35,958
Oregon	837	181	0	4,109	0	5	0	5,955	0	0	0	2,837	0	0	0	98	12,959	26,439
California	20,537	19,460	15,903	7,305	14,214	6,438	7,807	0	5,015	4,998	4,891	0	4,379	4,345	4,086	3/ 2	125,122	246,494
Total	22,204	19,738	15,903	14,440	14,214	6,443	7,815	5,796	5,015	4,998	4,891	4,479	4,379	4,364	4,086	108	148,129	308,891
Territories 4/																		
	14-4-10	15-4-7	14-2-8	10-10-8	6-8-10	8-0-10	12-6-10	12-4-10	18-1-16	11-1-12	9-10-5	12-2-10	12-10-5	16-4-5	10-6-14			
Puerto Rico	13,685	16,577	13,775	14,868	12,365	10,626	9,736	8,951	7,658	7,123	4,322	3,858	3,700	3,686	3,371	25	24,773	181,109
Continental United States																		
	5-10-10	1-12-12	4-12-12	5-20-20	5-10-5	10-10-10	4-16-16	12-12-12	1-9-9	4-10-7	2-12-12	4-10-6	3-9-6	6-12-12	0-20-20			
New England	54,710	653	0	0	4,397	29,628	0	2,000	0	0	34	0	0	1,999	15,534	188	240,020	347,570
Middle Atlantic	780,705	27,689	25,359	344	109,079	151,430	844	4,000	188	0	30,999	0	15	87,916	59,388	177	581,239	1,719,886
South Atlantic	378,649	87,433	383,751	647	140,869	34,808	56	5,121	476,763	48,742	365,286	368,779	292,050	12,324	1,871	913	2,044,946	4,839,495
East North Central	116,825	889,608	614	500,871	10,360	325,216	567,999	262,254	239	0	0	0	0	37,956	146,283	182	580,294	3,379,849
West North Central	1,131	68,963	146	175,463	6,888	60,710	19,270	180,752	0	0	0	0	0	14,090	50,969	264	583,515	1,181,797
East South Central	39,553	68,980	127,173	7,729	107,079	27,599	7,464	11,076	1,019	420,881	4,466	0	75,492	238,477	21,653	144	882,586	1,930,701
West South Central	11,847	28,139	132	12,840	218,103	9,651	3	34,621	117	0	0	0	0	4,770	10,728	139	380,646	701,099
Mountain	5	0	0	0	0	1,836	0	6	0	0	0	0	0	0	819	149	43,280	47,896
Pacific	1,647	13	0	385	101	22,205	0	0	10	0	0	18	0	101	510	114	281,345	308,891
Total	1,384,072	1,171,479	737,215	698,511	670,083	659,090	615,596	500,839	478,163	469,541	400,811	368,797	367,517	395,595	310,275	1,387	5,440,733	14,529,159

1/ Exclusive of mixtures not reported by grade. 2/ Including the tonnage of mixtures not reported by grade. 3/ Total number of mixtures ranges over 500 but only 15 reported by grade. 4/ Total consumption in Hawaii was 65,385 tons of mixed fertilizers, comprising 130 grades, which were manufactured to consumer's specifications. Data for Alaska not available. Estimated less than 500 tons.

Arcadian® News

Volume 2 | For Manufacturers of Mixed Fertilizers | Number 7

SUPERPHOSPHATE IS KEY TO FERTILIZER PROGRESS

Great Gains were made with Acidulation and Ammoniation

The greatest progress which has been accomplished in the manufacture of fertilizers in this country centers on superphosphate and is the result of industry research.

Research by fertilizer manufacturers developed: **1**) The production of superphosphate by the acidulation of phosphate rock. **2**) The production of nitrogen solutions for the ammoniation of superphosphate to provide an economical base for mixed fertilizers.

Superphosphate is the heart of a fertilizer technology which has supplied American farmers with millions of tons of efficient crop-producing power at low cost. And this technology is the fruit of industry initiative.

Superphosphate has many advantages over other phosphorus carriers. It is the lowest cost source of phosphorus. It contains large quantities of gypsum. Gypsum is an excellent soil conditioner and also provides large quantities of calcium and sulphur, both of which are essential plant foods.

Superphosphate supplies phosphorus that remains in the soil available to plants over a longer period than phosphorus from other carriers. Other forms of phosphorus have a greater tendency to become fixed in the soil in compounds that cannot be absorbed by plants.

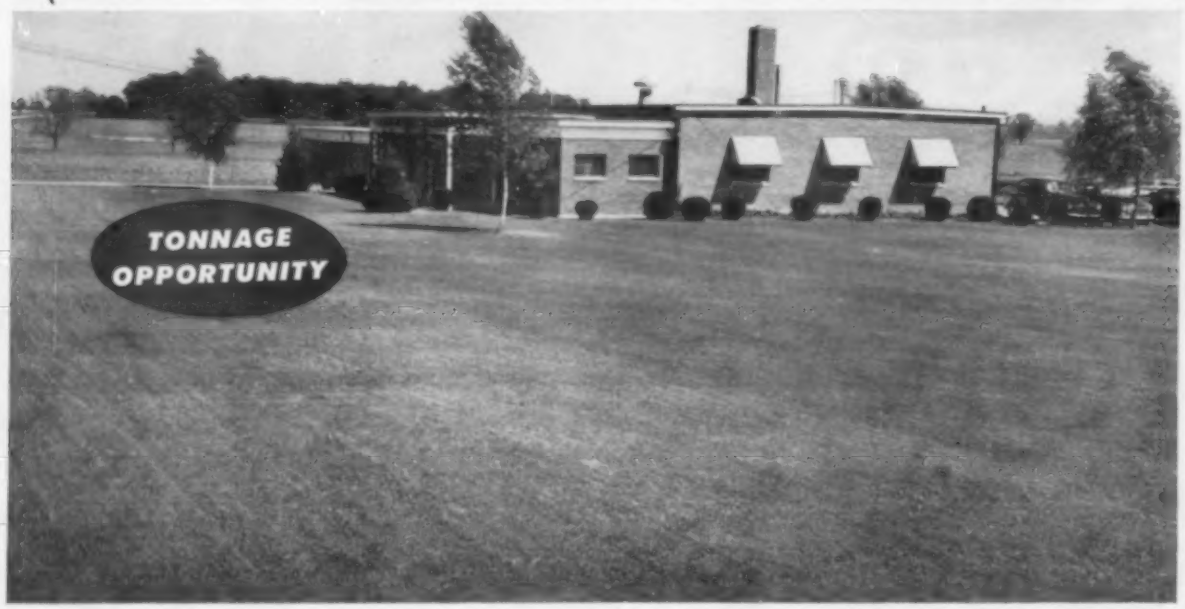
Superphosphate will absorb more low-cost nitrogen through ammoniation with low-cost nitrogen solutions than any other form of phosphorus. Low-cost superphosphate and low-cost nitrogen solutions have enabled fertilizer manufacturers to supply farmers with low-cost, high-quality fertilizers.

Industry research in the ammoniation of superphosphate with nitrogen solutions has helped in the development of granular mixed fertilizers.

Industry research with ammoniated superphosphate has helped in the improvement of the condition of all types of fertilizers and helped in the development of granular fertilizers. High take-up of free ammonia by superphosphate is desirable in any fertilizer and particularly desirable in granular fertilizers. High rate of ammoniation provides nitrogen at low cost and also provides heat at an opportune time in the granulation process.

As long as fertilizer manufacturers continue to make the largest possible utilization of superphosphate and high levels of ammoniation, the situation favorable to the increased use of fertilizer will exist and flourish.

Arcadian News for Fertilizer Manufacturers . . . . . from NITROGEN DIVISION



GRASS...big fertilizer market!

Just look around you and everywhere you'll see a big, new fertilizer market growing up fast. It's grass!

Attractive lawns are the pride of modern homeowners, and the first goal of new residents. Fine, healthy turf is of top importance to parks, playgrounds and golf courses. New plants and offices that dot the suburbs and countryside are landscaped in grass. Millions of miles of highways are banked by grass.

Every year 1¼ million acres of land go out of farming and become homes, roads and factories. Most of this area is actually planted to grass.

The roll of the golf ball, the happiness of the Little Leaguer, the gratification of the homeowner and plant manager, the job of the greenskeeper, and the protection and beautification of our roadsides *all* depend on keeping grass growing well. And that takes special fertilizer.

Grass Needs Enduring Nitrogen

Yes, we all like good grass in our surroundings, but not all of us have it. Crop fertilizers used for turf often produce luxuriant growth for a few weeks, then grass comes to a standstill until more fertilizer containing nitrogen is applied.

Golf course superintendents have learned to keep greens and fairways fertilized throughout the year, but most persons can't be bothered. And there's no reason why they should be! Now wonderful new fertilizers containing N-dure* nitrogen provide enduring nitrogen that feeds grass thoroughly and evenly for months. It is ideal for ornamentals too, and for specialty crops.

Nitrogen Division research has perfected a combination of N-dure urea-formaldehyde solution and urea for use in fertilizers to make nitrogen available to plants at a uniform rate for months, instead of in a sudden splurge.

N-dure enables fertilizer manufacturers to provide economical, enduring nitrogen in mixing semi-granular, non-segregating, non-burning fertilizers. This golden liquid urea-formaldehyde solution, with additional urea, builds urea-form during the manufacturing process of making a chemically-controlled mixed fertilizer.

N-dure and urea in mixed fertilizers result in enduring nitrogen at economical cost, with no burning, no leaching and no harmful residues. Also, there's a saving of labor for the user.

You get non-dusting, semi-granular condition by using N-dure plus urea in making a lasting mixed fertilizer. Formation of ureaform in the process of mixing helps to reduce hazard of burning from other fertilizer salts as well as from nitro-

*Trade-mark

SINGLE APPLICATION OF FALL FERTILIZER SAVES WORK IN GROWING WHEAT

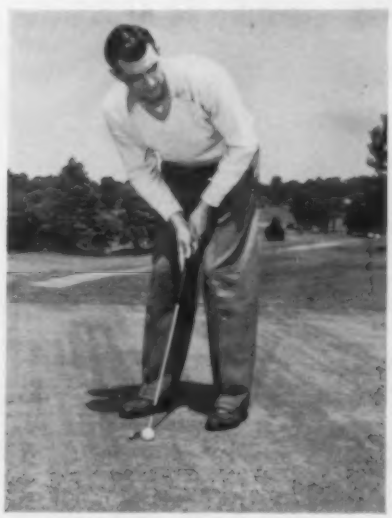
Several years of wheat fertilizer demonstrations on farms in 14 Ohio counties show that 1-1-1 ratio fertilizers produce better yields than low-nitrogen mixed fertilizers such as 3-12-12 or 5-14-14. Also, application at seeding time of 400 pounds of 10-10-10 gave as good yields as a split application of 200 pounds per acre of 10-10-10 in fall plus 200 pounds per acre in spring top-dressing. Over two seasons, average yield with fall application of 400 pounds of 10-10-10 was 38.9 bushels. With split application of 400 pounds of 10-10-10, yield was 38 bushels. With low-nitrogen mixed fertilizer, applied either in the fall or in split application, yield averaged 35.6 bushels.

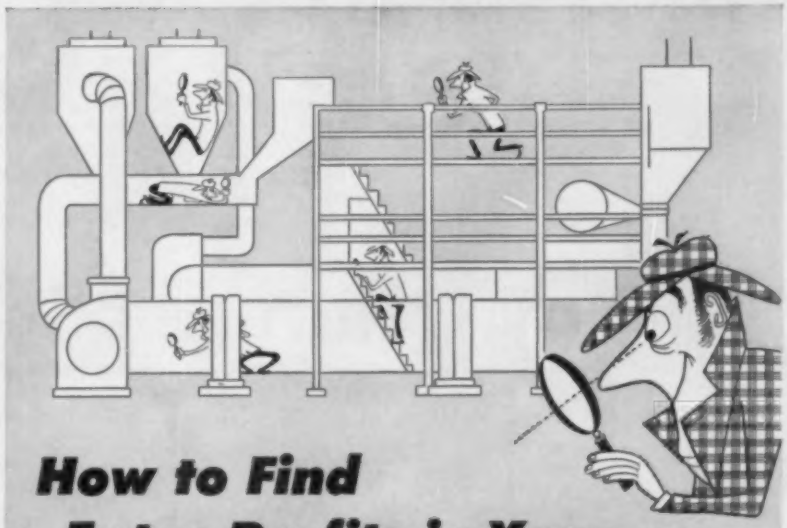
Highest yield on any farm using a single fall application of 400 pounds of 10-10-10 was 53.3 bushels. Highest yield with a split application of 400 pounds of 10-10-10 was 52.2 bushels. Best yield with a low-nitrogen fertilizer, 400 pounds of 5-10-10, was 45.7 bushels.

gen. In well-balanced mixed fertilizers, mixtures can be made in a wide variety of nitrogen ratios. You can easily control the ratio of lasting action to quick action with standard ammoniating equipment.

The fall months are a perfect time to fertilize grass and ornamentals, and this year more people than ever before will be in the market for fertilizer.

For full information on how N-dure can help you make profits from the growing turf and specialty market, write to Nitrogen Division, Allied Chemical, 40 Rector Street, New York 6, N.Y.





How to Find Extra Profits in Your 1957-58 Production Plans

In making plans for your 1957-58 production, the best place to look for bigger profits may be right in your own plant. Sometimes operating costs, higher than necessary, are "hiding" in a fertilizer plant that seems to be operating smoothly. If you can reduce these costs you will increase your profits.

One of the practical ways to pare down costs is to use the nitrogen solutions and other ingredients specifically adapted to the fertilizers you plan to produce. With the selection of the right methods and materials, you may be able to cut costs and improve quality in all your mixed fertilizers.

Why not get the help of a Nitrogen Division technical man? He will be glad to suggest immediate and economical changes to help you gear your output into a much more profitable operation. His services are available to Nitrogen Division customers without cost. Whether your problems are in ammoniation, formulation, granulation, condition, converting old equipment or selecting new, you can receive this technical service fast.

Manufacturing Know-how

Nitrogen Division maintains a large staff of trained technologists, experienced in all phases of the fertilizer business. The skills and abilities of hundreds of well-qualified scientists, technicians, and engineers are available to help work out your problems. This technical service staff uses millions of dollars' worth of laboratory and pilot plant equipment.

Ask your Nitrogen Division salesman to line up the technical aid essential to the solution of your problems. He can call for ready help that will come up with realistic answers to any fertilizer production situation. This Nitrogen Division service is based on 30 years of fertilizer and nitrogen experience.

Right in your own plant, as well as in their laboratories, Nitrogen Division technicians will work on your trouble spots until a practical answer develops. But they are more than trouble shooters. They have spent years in originating new and better nitrogen solutions to fit your manufacturing methods. Their goal is to help you streamline your plant operations to get best results, with the least possible change in equipment.

Their Full-time Job

If you contemplate production of mixed fertilizers new to your plant, their assistance will be of special benefit. Nitrogen Division technical men do not sell equipment. They spend their full time developing nitrogen solutions and helping organize production line systems for making high-quality, pulverized and granular fertilizers at low cost.

Extensive and continuing research by Nitrogen Division developed major innovations in fertilizer practice, such as ammoniation of superphosphate. Nitrogen Division knows fertilizer plant methods, inside and out! You can get prompt and efficient assistance from the technical service staff right now—and remember, it's without charge to customers. Talk to your Nitrogen Division salesman, or contact Nitrogen Division, Allied Chemical, 40 Rector St., New York, N. Y.

NITROGEN *plus* SERVICE

There are many reasons why it pays you to deal with Nitrogen Division, Allied Chemical. You are served by America's leading producer of the most complete line of nitrogen products. You benefit from millions of tons of nitrogen experience and the enterprising research that originated and developed nitrogen solutions for the fertilizer industry. You are assured of dependable supplies from three huge plants at Hopewell, Ironton, and Omaha. Your nitrogen is delivered to you by the best transportation facilities and equipment. You get technical assistance and formulation advice from the largest and most efficient staff of nitrogen experts. Your sales are supported by the most powerful advertising campaign ever conducted to sell fertilizers. Nitrogen Division is your headquarters for NITROGEN *plus* SERVICE. Look over the big line and contact one of the 14 offices listed below.

Arcadian® Nitrogen Solutions

	CHEMICAL COMPOSITION %					PHYSICAL PROPERTIES		
	Total Nitrogen	Anhydrous Ammonia	Ammonium Nitrate	Urea	Water	Approx. Sp. Grav. at 60°F	Approx. Vap. Press. at 104°F per Sq. In. Gauge	Approx. Temp. at Which Salt Begins to Crystallize °F
NITRANA®								
2	41.0	22.2	65.0	—	12.8	1.137	10	21
2M	44.0	23.8	69.8	—	6.4	1.147	18	26
3	41.0	26.3	55.5	—	18.2	1.079	17	-25
3M	44.0	28.0	60.0	—	12.0	1.083	25	-36
3MC	47.0	29.7	64.5	—	5.8	1.089	34	-30
4	37.0	16.6	66.8	—	16.6	1.188	1	56
4M	41.0	19.0	72.5	—	8.5	1.194	7	61
6	49.0	34.0	60.0	—	6.0	1.052	48	-52
7	45.0	25.3	69.2	—	5.5	1.134	22	1
URANA®								
10	44.4	24.5	56.0	10.0	9.5	1.108	22	-15
11	41.0	19.0	58.0	11.0	12.0	1.162	10	7
12	44.4	26.0	50.0	12.0	12.0	1.081	25	- 7
13	49.0	33.0	45.1	13.0	8.9	1.033	51	-17
15	44.0	28.0	40.0	15.0	17.0	1.052	29	1
U-A-S®								
A	45.4	36.8	—	32.5	30.7	0.925	57	16
B	45.3	30.6	—	43.1	26.3	0.972	48	46
Anhydrous Ammonia	82.2	99.9	—	—	—	0.618	211	—

Other ARCADIAN® Nitrogen Products: UREA 45 • A-N-L® Nitrogen Fertilizer
Ammonium Nitrate • American Nitrate of Soda • Sulphate of Ammonia

NITROGEN DIVISION Allied Chemical & Dye Corporation

MAIN OFFICE: 40 Rector Street, New York 6, N. Y., Phone: Hanover 2-7300

Branch Offices	Phone
Hopewell, Va., P. O. Drawer 131	Cedar 9-6301
Ironton, Ohio, P. O. Box 98	Ironton 8-4366
Omaha 7, Neb., P. O. Box 166	Bellevue 1464
Raleigh, N. C., 16 W. Martin St.	Temple 3-2801
Columbia 1, S. C., 1203 Gervais St.	Columbia 3-6676
Atlanta 3, Ga., 127 Peachtree St., N. E.	Jackson 2-7805
Memphis 9, Tenn., 1929-B South 3rd St.	Whitehall 8-2692
Columbia, Mo., P. O. Box 188	Gibson 2-4040
Indianapolis 20, Ind., 6060 College Ave.	Clifford 5-5443
Kalamazoo, Mich., P. O. Box 869	Kalamazoo 5-8676
St. Paul 4, Minn., 45 N. Snelling Ave.	Midway 5-2864
Los Angeles 5, Cal., 2999 West 6th St.	Dunkirk 8-3201
San Francisco 4, Cal., 235 Montgomery St.	Yukon 2-6840

tures (44,095 tons, 12 percent), ammonium nitrate (174,692 tons, 16 percent), and ammonium sulfate (105,570 tons, 20 percent).

Phosphate rock was the only phosphate material that showed a large increase in consumption (330,812 tons, 57 percent), nearly all of which was in Illinois and Missouri, the States using more than 85 percent of the total tonnage of this material in 1955-56. The other increases in phosphate materials were chiefly in basic slag (20,882 tons) and the total for all kinds of ammonium phosphate products (23,011 tons). Decreases in the consumption of superphosphates containing 22 percent or less of available P_2O_5 occurred in all the regions and totaled 78,696 tons (11 percent). The decrease of 16,217 tons (5 percent) in the consumption of superphosphates containing more than 22 percent P_2O_5 was spread over 5 of the 10 regions. No consumption of fused tricalcium phosphate was reported for 1955-56; manufacture of this material by the Tennessee Valley Authority the only producer, ceased in the year ended June 30, 1954.

The consumption of potash materials for direct application increased only 0.9 percent (from 401,084 tons to 404,839 tons). Among the individual materials, the use of the 58-62 percent grades of potassium chloride, which comprised 76 percent of the total consumption of potash materials, showed the largest increase in quantity (27,821 tons, 10 percent).

As in previous years, calcium sulfate accounted for most of the tonnage of secondary and trace nutrient materials; the proportion was 94 percent (738,499 tons) in 1955-56.

The weighted average primary nutrient content of the various classes of materials consumed is given in table 7. These averages are based on the composition and tonnage of the individual materials comprising the respective classes. In 1955-56 for materials containing only nitrogen, P_2O_5, or K_2O, the respective national averages were 32.35, 16.55 (available P_2O_5), and 55.64 percent, while the

(Continued on Page 94)

Table 1a.

Regional change in consumption of fertilizers in year ended June 30, 1956, from that in the preceding year.

Region	Tons			Percent		
	Mixtures	Materials 1	Total	Mixtures	Materials 1	Total
New England	— 17,491	— 5,890	— 23,381	— 4.79	— 7.90	— 5.32
Middle Atlantic	—158,999	— 18,517	—177,516	— 8.37	— 8.35	— 8.37
South Atlantic	— 88,742	— 49,700	—138,442	— 1.80	— 4.27	— 2.27
East North Central	—141,796	+139,414	— 2,382	— 4.03	+14.00	— .05
West North Central	—102,598	— 17,376	—119,974	— 7.99	— 1.93	— 5.49
East South Central	— 32,145	— 3,454	— 35,599	— 1.60	— .37	— 5.49
West South Central	— 5,093	+ 7,052	+ 1,959	— .72	+ 1.07	+ .14
Mountain	— 3,423	— 42,330	— 45,753	— 6.67	—11.31	—10.75
Pacific	+ 11,239	+ 37,249	+ 48,508	+ 3.78	+ 1.95	+ 2.20
Continental U. S.	—539,028	+ 46,448	—492,580	— 3.58	+ .64	— 2.21
Territories	— 33,169	— 7,643	— 40,812	—11.86	— 4.77	— 9.28
Total	—572,197	+ 38,805	—533,392	— 3.73	+ .52	— 2.35

1 Including secondary and trace nutrient materials.

Table 5. - Fertilizer materials consumed for direct application, by States, year ended June 30, 1956, in tons[1]

State and Region	Chemical nitrogen materials									Natural organics[2]	Phosphate materials[3]				Potash materials		Total primary nutrient materials	Secondary and trace nutrient materials[4]
	Ammonia (anhydrous)	Ammonium nitrate	Ammonium nitrate-limestone mixtures	Ammonium sulfate	Calcium cyanamide	Nitrogen solutions and aqua ammonia[2]	Sodium nitrate	Urea	Other[2]		Phosphate rock[2]	Superphosphate: Grades 20 percent and under	Superphosphate: Grades over 20 percent	Other	Chloride 50-60 percent grades	Other[2]		
Maine	0	1,035	30	70	827	50	180	147	5	708	4	2,635	0	200	44	14	5,338	14
New Hampshire	0	590	11	2	79	1	74	23	3	653	2	2,520	0	72	57	31	4,149	3
Vermont	0	457	49	3	12	0	62	153	2	149	90	16,077	5	31	205	10	16,119	84
Massachusetts	0	1,012	34	166	873	0	741	130	46	8,811	880	3,053	0	635	495	97	15,676	98
Rhode Island	0	103	4	0	287	0	58	14	5	589	0	270	0	54	99	2	1,771	6
Connecticut	1	718	36	88	344	1	634	108	28	12,095	54	6,007	71	1,435	781	861	22,313	176
New England	1	3,915	171	251	2,422	55	1,751	575	88	23,115	980	31,400	80	2,430	1,711	1,017	69,372	513
New York	241	11,653	611	312	3,498	674	4,041	779	235	10,347	319	34,334	430	1,070	759	748	69,677	731
New Jersey	261	1,897	492	75	1,584	489	2,108	946	252	7,771	647	4,102	18	1,966	570	172	22,942	158
Pennsylvania	577	5,138	998	2,183	1,733	1,446	1,522	696	265	9,375	4,552	32,494	240	1,994	807	484	64,306	2,416
Delaware	134	1,183	89	1	615	987	170	60	0	541	170	454	140	70	435	0	4,898	98
District of Columbia	0	7	0	0	2	0	20	20	0	652	0	7	0	57	0	0	766	0
Maryland	486	1,191	591	67	1,410	810	1,460	449	10	1,607	1,613	3,520	7	594	610	1,176	15,435	310
West Virginia	0	855	867	254	10	20	1,686	70	0	378	132	5,736	280	54	80	0	9,996	8
Middle Atlantic	1,679	22,124	3,255	2,892	8,852	4,426	11,064	2,820	762	30,670	7,433	84,747	1,095	5,775	3,460	2,580	199,190	3,721
Virginia	839	5,142	22,938	2,239	1,986	4,671	21,820	393	1	951	1,333	7,814	166	1,968	2,870	16,493	88,821	16,480
North Carolina	6,454	12,658	108,208	216	6,837	12,982	100,298	1,360	0	3,814	1,442	14,577	67	6,181	10,177	10,513	309,628	45,436
South Carolina	826	18,961	82,272	420	1,886	5,711	87,514	495	0	600	976	11,017	0	5,812	17,841	9,075	244,906	1,979
Georgia	7,582	46,300	47,088	2,413	2,970	1,844	79,734	268	151	9,134	207	39,059	185	7,471	6,822	2,849	246,263	20,677
Florida	1,087	11,337	5,394	2,519	11,632	2,128	28,586	2,012	11,559	11,003	22,543	8,231	211	5,777	8,319	17,744	132,575	5,852
South Atlantic	16,788	96,420	266,448	8,864	25,311	27,356	320,952	5,321	11,979	26,672	28,461	82,918	630	26,872	46,829	56,674	1,017,196	90,514
Ohio	2,241	12,699	380	6,731	1,110	2,410	819	1,676	37	7,151	6,001	12,613	2,382	2,167	1,249	857	64,629	185
Indiana	11,002	35,665	158	1,060	324	6,388	232	6,551	20	1,057	15,877	5,089	11,164	2,508	39,254	510	142,752	208
Illinois	16,570	43,389	1,260	27,211	594	6,672	13	5,250	21	12,040	570,794	40,569	27,115	10,187	76,301	60	844,773	746
Michigan	1,797	9,737	67	5,161	181	1,164	340	2,153	66	12,640	1,588	8,845	1,009	906	1,501	693	48,274	993
Wisconsin	1,346	5,830	0	219	88	1,071	0	235	2	9,070	5,860	1,997	822	717	6,470	605	32,320	21
East North Central	33,956	107,320	1,865	45,082	2,297	17,705	1,404	15,865	146	42,958	599,910	69,113	42,701	16,715	126,775	2,746	1,132,750	2,153
Minnesota	13,694	6,811	0	449	85	5,580	0	500	35	4,044	1,852	4,779	25,838	10,238	3,716	211	76,611	2,154
Iowa	10,521	27,302	0	444	245	6,250	0	1,946	2	6,167	9,141	33,159	20,577	20,081	9,075	99	143,151	212
Missouri	15,538	57,181	0	540	40	4,369	18	744	5	3,761	238,112	3,822	6,397	7,470	19,297	361	355,627	14
North Dakota	102	347	0	20	0	65	0	40	0	64	40	10	17,588	26,388	29	0	45,309	1
South Dakota	1,618	2,455	0	7	0	119	0	194	0	388	138	571	4,812	6,436	31	0	17,179	0
Nebraska	36,153	30,013	171	310	0	11,793	0	8,607	0	3,127	266	2,480	17,994	9,521	285	0	112,416	64
Kansas	8,650	30,458	0	647	0	634	1	738	2	851	1,311	5,459	34,176	17,549	1,730	0	103,617	11
West North Central	85,886	163,735	171	2,727	371	35,840	20	12,827	45	14,707	256,852	52,511	127,579	117,538	34,157	671	880,150	2,256
Kentucky	1,641	29,387	111	409	1,409	474	1,467	162	7	5,38	15,38	20,156	2,516	9,389	9,303	6,395	102,760	119
Tennessee	12,031	35,762	488	698	1,880	0	16,254	11	6	1,288	1,739	10,573	4,987	7,750	11,383	1,253	105,702	289
Alabama	2,837	79,130	35,178	2,884	717	734	65,055	179	3	503	3,849	21,415	373	20,088	9,871	49	242,732	1,340
Mississippi	12,256	119,498	7,723	1,758	11,634	588	52,882	888	0	64	4,388	32,760	2,315	34,670	24,900	845	417,738	12
East South Central	61,677	283,681	43,498	5,886	15,860	1,796	136,138	1,240	16	8,276	25,381	89,896	10,171	101,370	53,219	8,542	917,393	1,700
Arkansas	23,038	63,607	30	4,123	10,783	727	23,830	6,452	1	96	671	7,977	9,645	4,013	32,603	354	188,087	1
Louisiana	25,510	35,901	529	9,384	2,815	2,819	24,118	1,821	210	931	6,295	16,027	2,982	5,961	6,841	738	139,906	55
Oklahoma	1,621	5,693	69	771	0	73	759	278	1	1,139	1,783	20,139	6,600	9,186	889	46	48,961	11
Texas	41,592	22,298	0	43,095	2,778	6,549	3,883	5,284	496	7,202	6,310	57,464	27,795	60,138	971	91	276,213	2,488
West South Central	91,750	127,509	627	57,493	15,554	10,773	52,590	13,835	708	9,127	15,739	99,556	47,151	81,660	40,304	1,229	664,167	2,555
Montana	1,088	2,910	0	2,699	0	188	0	201	0	196	0	90	16,070	4,638	62	0	28,042	2,189
Idaho	4,482	6,949	0	3,018	139	3,753	20	1,405	96	288	0	3,888	16,146	7,949	109	0	52,813	6,204
Wyoming	0	842	0	420	0	25	0	262	0	1	0	25	5,895	1,461	87	0	8,479	661
Colorado	2,614	10,190	199	3,688	10	789	0	1,384	0	1,185	0	793	13,888	5,481	430	294	41,323	186
New Mexico	4,520	1,174	0	862	0	0	0	1,674	40	1,117	0	5,611	8,868	6,049	64	0	27,159	0
Arizona	14,427	8,083	0	23,174	813	10,593	704	10,604	9,591	6,979	0	5,174	1,395	28,419	288	1,034	125,508	10,961
Utah	1,881	6,138	0	5,781	0	88	0	384	3	866	0	1,844	5,389	3,379	38	0	26,201	237
Nevada	14	46	0	432	0	116	0	97	0	334	0	40	497	733	0	0	2,218	1,007
Mountain	28,976	36,514	199	46,292	970	15,569	736	16,311	9,690	11,067	0	16,479	88,044	58,127	1,082	1,328	311,743	20,437
Washington	19,013	22,019	0	10,373	24	28,753	97	1,772	2,158	4,459	416	5,868	7,385	14,138	2,465	289	121,470	12,815
Oregon	5,353	22,582	0	18,666	637	12,467	0	2,631	1,548	761	37	10,573	883	26,311	2,739	103	127,539	15,981
California	68,512	58,179	0	140,934	6,238	216,857	185	18,796	15,811	106,882	1,750	64,251	17,592	101,566	1,896	5,295	1,018,513	620,638
Pacific	92,878	98,780	0	170,973	7,118	258,077	282	23,207	19,550	112,097	2,203	80,692	25,860	142,015	7,100	5,777	1,267,515	657,072
Continental U. S.	416,453	940,625	316,290	339,427	65,818	365,637	542,562	81,815	24,600	478,457	926,026	601,693	324,059	610,671	377,701	80,650	6,478,344	786,649
Hawaii	0	41	0	11,397	0	58,254	233	8,216	66	43	2,888	3,092	1,599	2,762	19,626	1,673	97,743	2,956
Puerto Rico	2,001	0	0	43,574	0	2,912	9	288	0	0	0	1,236	95	1,219	188	102	51,725	0
Alaska[5]	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Territories	2,001	41	0	54,971	0	61,166	242	8,518	66	43	2,888	4,328	1,694	3,981	19,814	1,775	149,468	2,956
Total: 1955-56	418,454	940,666	316,305	414,398	65,818	426,803	542,804	90,333	24,666	478,500	928,914	607,026	325,723	614,652	397,515	82,428	6,627,812	789,605
1954-55	353,681	1,115,358	358,023	519,958	66,882	840,574	615,842	68,585	59,954	461,100	604,653	685,722	342,940	2/ 592,340	328,657	82,427	2/ 6,587,000	2/ 781,606
1950-51	350,474	984,736	380,601	538,716	68,213	181,580	653,105	(3/)	144,904	420,666	912,676	788,307	247,142	598,641	359,735	61,818	6,616,910	615,513

1/ Includes fertilizers distributed by Government agencies. Excludes lime and the quantities of materials used for manufacture of commercial mixtures. 2/ The principal fertilizers are shown separately in Table 5, by regions. 3/ Includes colloidal phosphate the quantity of which is shown separately in Table 5, by regions. 4/ Includes an estimated 245,000 tons of dried manures. 5/ Not available; estimated less than 1,000 tons. 6/ Revised - 8,541 tons of basic slag was deleted from the Pennsylvania total. 7/ Revised - 11,298 tons of calcium sulfate (gypsum) was added to the North Carolina total. 8/ Withheld to avoid disclosing figures for individual establishments.

Table 5. - Kinds of fertilizers consumed in regions of the United States, year ended June 30, 1956, in tons[1]

Kind	New England	Middle Atlantic	South Atlantic	East North Central	West North Central	East South Central	West South Central	Mountain	Pacific	Territories [2]	Total
MIXTURES: N-P-K	102,845	1,639,449	4,438,561	3,100,385	260,485	1,021,795	635,688	23,462	248,214	188,360	13,417,844
N-P	811	281	2,323	24,484	139,278	1,761	40,769	28,294	73,038	5,217	289,137
P-K	24,644	59,982	216,067	234,961	86,006	153,070	25,818	272	2,492	1,167	846,419
N-K	0	172	186,544	2	28	2,073	892	40	1,261	20,730	222,651
CHEMICAL NITROGEN MATERIALS											
Ammonia, anhydrous	3	1,679	16,780	16,905	85,868	61,677	51,756	88,975	38,776	2,601	[3]418,454
Ammonia, aqua: 20-26% N	0	21	200	2,870	1,140	0	2,819	9,865	319,827	53,886	[3]390,628
Ammonium nitrate	1,910	22,124	96,480	309,884	163,795	283,681	127,309	35,514	36,780	41	960,666
Ammonium nitrate-limestone mixtures	171	2,935	264,448	1,895	173	43,498	607	197	0	0	313,924
Ammonium sulfate	251	2,892	6,841	45,022	2,797	5,206	37,893	46,959	181,973	54,971	414,198
Calcium cyanamide	1,269	6,971	15,639	1,231	171	14,860	15,594	970	7,118	0	65,814
Calcium nitrate	0	5	10,498	0	0	0	196	9,617	19,989	68	39,965
Nitrogen solutions: 20-41% N	55	4,117	27,158	16,761	27,809	1,796	7,853	5,703	18,250	0	[3]108,895
Sodium nitrate	1,751	11,084	320,900	1,423	22	150,198	50,168	734	282	249	542,804
Urea	575	2,849	5,321	15,994	6,677	1,840	13,239	15,321	22,707	6,938	96,373
Other	82	759	1,206	131	43	13	630	43	6,561	0	[4] 9,081
NATURAL ORGANIC MATERIALS											
Blood, dried	20	173	44	0	0	1	0	19	2,547	0	2,804
Castor pomace	2,456	95	1,668	0	0	0	0	0	937	0	5,176
Compost [1]	0	136	3	4,979	395	95	8,979	200	0	0	8,577
Cottonseed meal [1]	7,143	44	2,207	0	0	16	0	0	1	0	9,411
Fish scrap, meal, emulsions	505	0	28	0	0	0	0	0	1,683	0	2,216
Manures, dried	4,379	16,972	2,774	6,107	2,806	1,867	3,149	1,480	247,559	9	285,675
Sewage sludge, activated	5,472	12,865	7,160	29,097	11,108	1,277	1,426	10,629	30,100	40	101,166
Sewage sludge, other	0	0	0	556	103	0	0	205	34,983	0	35,851
Tankage, animal	0	203	136	0	0	0	0	0	1,326	0	1,665
Tankage, process	2,774	8,160	3,598	297	5	4	0	490	300	0	15,650
Other	586	0	976	0	0	16	0	0	8,857	0	[5] 4,435
PHOSPHATE MATERIALS											
Ammonium phosphate: 11-48 [6]	0	7	0	1,747	29,974	0	2,241	3,351	14,199	2,409	47,128
" " 11-50 [6]	0	0	0	0	1,113	0	0	50	483	0	1,646
" " 13-39 [6]	0	0	0	498	10,567	0	13,669	3,088	6,811	0	42,127
Ammonium phosphate sulfate: 16-48 [6]	0	0	0	402	38,666	210	98,130	38,402	59,503	833	251,546
Ammonium phosphate nitrate: 27-14 [6]	0	0	0	0	606	0	0	(10)	5,246	0	5,850
Ammoniated superphosphate [1]	0	0	268	0	0	0	44	0	5,672	1,215	7,199
Basic lime phosphate	0	0	693	0	0	0	5	0	0	0	698
Basic slag	0	48	21,974	0	0	146,943	2,300	0	0	0	[7] 171,865
Bonemeal, raw	32	359	289	136	178	22	396	40	1,016	0	2,668
Bonemeal, steamed	1,472	4,972	878	1,463	21	297	184	0	1,454	0	10,741
Calcium metaphosphate	0	299	2,198	9,098	15,408	13,887	2,550	186	0	0	43,626
Dicalcium phosphate: 21-51 [6]	150	31	493	1,215	3,946	1,894	2,428	4,127	280	120	13,854
Phosphoric acid: 36-54% P_2O_5	0	0	0	0	0	35	708	6,530	7,948	0	[8] 15,221
Phosphate rock	366	8,023	27,863	595,671	869,504	16,310	18,297	0	1,787	6,888	913,909
Colloidal phosphate	0	40	600	3,239	2,758	8,451	1,501	0	416	0	17,005
Precipitated bone	801	0	0	0	0	0	0	0	0	0	801
Superphosphate: 18%	3,743	11,662	22,346	23,379	17,604	19,139	0	518	832	0	99,225
" 19%	180	24	1,823	0	97	22	0	6,707	72,897	0	81,750
" 20-22%	27,477	73,081	58,247	46,469	31,810	68,695	99,558	9,454	6,907	9,333	426,051
" 23-41%	0	8	0	1,644	291	0	9,638	1,159	0	0	12,740
" 42-44%	0	0	0	0	36,170	0	35	35,296	10,365	0	71,866
" 45%	73	737	39	31,193	68,256	1,365	18,117	16,706	1,809	19	136,464
" 46%	0	251	9	7,481	29,190	4,373	1,864	15,483	13,666	1,645	69,962
" 47%	0	0	80	88	1,132	3,660	254	326	0	0	5,610
" 48%	7	9	449	201	5,430	8,787	1,016	0	117	0	10,716
" 49-50%	0	0	45	420	561	1,152	1,189	0	0	0	3,367
Other	0	0	186	0	0	0	0	0	0	[9]	186
POTASH MATERIALS											
Cotton hull ashes	630	2	311	0	0	0	0	0	0	0	945
Langbeinite mixtures [1]	0	1,093	22,359	0	0	0	0	0	0	0	[9] 23,452
Manure salts: 20-30% K_2O	0	10	717	25	0	0	220	0	0	0	972
Potassium chloride: 48-52% K_2O	2	224	5,508	1,328	1,170	1,321	2,432	10	1,186	0	13,181
" " 50-62% K_2O	1,709	2,845	34,721	125,447	18,967	31,918	18,078	914	5,925	14,710	309,230
" magnesium sulfate	116	598	2,109	1,600	466	1,469	101	0	208	0	6,668
" sodium nitrate	90	1	19,700	8	0	32	849	0	0	0	20,680
" sulfate	179	874	7,187	1,090	207	7,041	99	1,348	5,493	1,777	25,297
Other	0	6	4,211	1	0	0	0	0	73	0	[9] 4,291
PRIMARY NUTRIENT FERTILIZERS	415,942	1,930,264	5,056,893	4,512,599	2,861,947	2,838,690	1,366,256	359,599	1,196,313	389,962	21,403,465
SECONDARY & TRACE NUTRIENT MATERIALS											
Aluminum sulfate [1]	8	10	2	0	0	0	0	0	86	0	106
Borax [1]	63	284	744	104	40	304	22	0	386	0	2,057
Calcium sulfate (gypsum)	143	2,886	98,553	1,058	2,260	1,288	24	16,987	681,360	0	[9] 738,499
Copper sulfate [1]	0	36	382	55	15	0	0	5	133	0	626
Ferrous sulfate [1]	0	0	42	0	0	0	0	34	[11] 4,849	2,862	8,077
Magnesium sulfate [1]	89	316	1,983	280	5	0	0	0	109	22	2,504
Manganese sulfate [1]	0	143	259	[12] 901	0	0	30	1	52	0	1,386
Mixed minerals [1]	2	0	4	8	0	5	3	302	3,650	0	[13] 3,974
Sulfur: 25-99% S	10	70	402	38	49	1	8,034	2,536	20,001	0	25,141
Sulfuric acid: 40-93%	0	0	0	0	0	0	434	18	4,456	0	[14] 4,908
Zinc sulfate [1]	0	24	131	1	1	22	0	8	[15] 1,888	32	[16] 2,085
SECONDARY & TRACE NUTRIENT MATERIALS	315	3,733	96,514	2,245	2,378	1,700	2,555	20,137	697,072	2,956	[17] 789,605
ALL FERTILIZERS	416,257	1,940,997	5,953,407	4,514,844	2,864,325	2,840,390	1,368,811	379,736	2,253,385	392,918	22,193,070

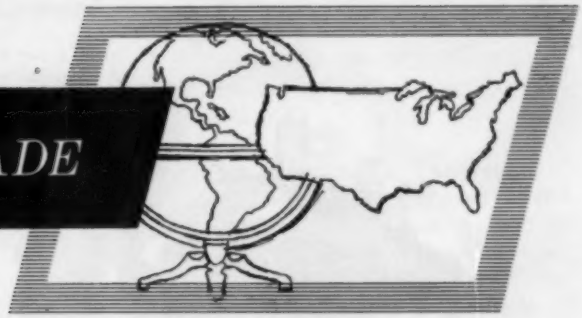
1/ Includes distribution by Government agencies. Does not include the quantities of materials used for the manufacture of the indicated quantities of commercial mixtures. 2/ Hawaii and Puerto Rico. 3/ 343,578 tons N. 4/ 62,510 tons N. 5/ 34,493 tons N. 6/ 1,769 tons N. 7/ Distributed by manufacturers of fertilizers. 8/ Average: 4.07-2.14-0.66. 9/ Includes quantities reported as mixtures. 10/ All quantities totaling 1,775 tons was, by error, left in mixtures. Their State totals are listed in Table 3. 11/ Additional quantities may have been reported as mixtures. 12/ 7,515 tons P_2O_5. 13/ 29 tons available P_2O_5. 14/ Additional quantities are given free to farmers for which no records are kept. 15/ 1,418 tons K_2O. 16/ Average 0.55-1.21-6.78. 17/ Includes 1,219 tons of ferrous oxide. 18/ Includes 71 tons of manganese oxide. 19/ Includes 109 tons of zinc oxide. 20/ Revised total for year ended June 30, 1955; basic slag, 150,983 tons; calcium sulfate, 738,814 tons.

Table 6. - Consumption of primary plant nutrients, year ended June 30, 1956, in tons[1]

State & Region	Content of mixtures					Content of all fertilizers [2]				
	Nitrogen	P_2O_5		K_2O	Total N, avail. P_2O_5, and K_2O	Nitrogen	P_2O_5		K_2O	Total N, avail. P_2O_5, and K_2O
		Available [3]	Total [4]				Available [3]	Total [4]		
Maine	13,625	20,472	21,591	22,110	56,207	14,209	21,114	22,257	22,152	57,475
New Hampshire	769	1,554	1,686	1,646	3,969	1,045	2,095	2,236	1,717	4,857
Vermont	1,270	5,124	5,279	5,488	11,882	1,523	6,698	6,975	5,654	15,875
Massachusetts	3,829	5,758	6,004	5,670	15,257	4,975	6,741	7,083	6,096	17,812
Rhode Island	737	1,348	1,384	1,376	3,461	892	1,440	1,480	1,432	3,754
Connecticut	1,288	5,989	6,260	5,453	13,730	4,342	7,050	7,598	6,191	18,117
New England	21,518	39,245	41,206	41,743	104,506	27,186	47,098	49,629	43,242	117,910
New York	30,730	37,833	61,659	48,487	117,050	38,096	66,122	70,562	49,521	153,739
New Jersey	13,370	25,537	26,351	25,157	64,064	15,888	27,083	28,111	25,686	68,657
Pennsylvania	30,482	70,299	73,017	67,367	168,148	35,554	78,044	82,343	68,088	181,686
Delaware	4,084	9,394	9,766	9,906	23,384	5,095	9,598	10,026	10,181	24,864
District of Columbia	125	167	180	94	386	182	208	223	97	407
Maryland	12,309	29,677	31,531	27,154	69,140	14,330	30,687	33,043	27,513	72,534
West Virginia	1,163	9,106	9,756	7,729	19,998	1,902	10,458	11,211	7,785	20,149
Middle Atlantic	93,263	182,013	212,262	185,894	482,170	113,039	222,208	235,521	189,873	524,116
Virginia	25,861	74,554	79,595	72,173	172,588	38,509	76,895	82,382	75,010	190,413
North Carolina	54,349	126,859	136,917	122,705	303,913	109,598	130,908	142,114	130,678	371,202
South Carolina	21,933	82,144	86,600	59,098	163,175	61,045	85,164	90,055	71,949	208,158
Georgia	42,260	102,972	110,353	101,412	246,646	88,146	111,776	119,635	108,281	308,503
Florida	68,793	81,691	99,528	100,844	251,330	86,186	85,122	109,376	104,508	275,836
South Atlantic	213,196	468,220	492,993	456,232	1,119,652	383,781	469,883	543,760	490,446	1,344,112
Ohio	47,064	134,393	142,491	132,410	313,867	57,672	139,456	149,512	134,705	331,833
Indiana	49,861	144,602	149,381	144,232	338,695	77,350	152,832	162,323	158,539	398,729
Illinois	30,448	75,555	78,979	77,308	183,311	72,784	119,292	129,201	123,939	316,010
Michigan	31,597	87,904	91,360	88,148	207,649	39,584	90,841	99,009	89,321	219,746
Wisconsin	15,127	61,350	63,175	72,007	148,504	20,811	52,874	66,715	76,174	139,859
East North Central	174,097	503,804	525,385	514,125	1,192,026	268,209	565,295	706,800	582,673	1,406,177
Minnesota	14,941	62,493	64,079	45,883	123,317	32,347	80,173	82,313	48,273	160,793
Iowa	20,228	36,968	39,507	39,304	116,500	43,917	81,143	87,055	44,838	169,898
Missouri	36,732	65,459	68,853	54,161	156,372	71,196	80,189	132,182	65,970	217,555
North Dakota	2,087	6,705	7,027	1,432	10,224	6,101	24,935	25,743	1,446	32,482
South Dakota	1,005	2,341	2,490	172	3,518	4,486	6,451	6,754	193	11,130
Nebraska	2,088	4,327	4,380	770	7,185	49,072	16,139	16,582	939	66,150
Kansas	7,866	16,757	17,304	4,248	29,871	13,680	43,476	44,980	5,302	62,958
West North Central	84,967	215,050	223,660	145,970	445,987	241,007	332,508	415,609	166,961	740,476
Kentucky	20,130	50,691	54,943	49,868	120,689	32,450	62,726	71,827	58,527	153,703
Tennessee	20,553	48,416	52,135	45,484	114,453	45,724	58,885	59,403	53,089	153,699
Alabama	31,678	86,644	90,876	67,965	186,248	82,748	96,936	103,930	73,664	252,448
Mississippi	19,038	32,171	34,552	27,002	78,431	116,497	48,578	51,723	41,162	206,237
East South Central	91,415	217,986	234,583	190,480	499,821	277,419	262,226	286,883	226,442	766,087
Arkansas	10,849	22,969	23,850	22,622	56,040	61,555	30,548	32,834	42,397	134,500
Louisiana	10,603	21,309	22,525	16,722	48,634	51,784	26,308	30,045	20,319	99,011
Oklahoma	5,673	12,576	13,146	5,163	23,414	10,764	24,420	26,354	5,722	40,906
Texas	22,066	42,702	44,718	21,219	85,987	87,711	82,207	86,958	21,937	191,855
West South Central	49,191	99,556	104,239	65,726	214,075	211,814	164,083	176,627	90,375	466,272
Montana	373	789	831	35	1,198	3,523	9,304	9,446	74	12,901
Idaho	736	867	1,010	143	1,766	11,081	10,602	11,002	223	21,906
Wyoming	201	424	447	34	659	947	3,414	3,486	52	4,411
Colorado	1,139	2,303	2,430	737	4,379	9,375	11,309	11,589	1,166	21,870
New Mexico	268	331	348	47	646	6,063	6,419	6,611	93	12,575
Arizona	2,437	2,933	3,097	545	5,915	35,997	13,677	14,037	1,266	50,940
Utah	469	377	644	166	1,212	6,017	4,901	5,127	186	11,104
Nevada	82	117	125	44	243	404	425	444	46	873
Mountain	5,925	8,341	8,932	1,752	16,018	73,407	60,071	61,742	3,106	136,582
Washington	2,825	5,264	5,455	3,961	12,050	37,998	13,612	14,055	5,640	57,250
Oregon	2,286	4,133	4,402	2,559	8,978	11,131	12,811	13,309	4,345	48,287
California	25,918	25,898	26,732	13,247	67,059	208,378	77,309	80,676	23,345	309,632
Pacific	31,029	35,295	36,589	21,767	88,087	277,507	103,732	108,040	33,330	415,169
Continental U.S.	767,605	1,769,648	1,880,409	1,625,689	4,162,342	1,875,371	2,227,892	2,621,607	1,835,638	5,938,901
Hawaii	7,792	5,809	5,888	11,016	23,990	24,356	8,206	9,128	20,717	53,279
Puerto Rico	21,316	10,803	10,159	18,847	50,366	32,876	11,322	12,683	18,363	62,561
Alaska [5]	---	---	---	---	---	---	---	---	---	---
Territories	29,068	16,005	17,381	29,863	74,356	57,232	19,528	21,811	39,080	115,840
Total: 1955-56	796,673	1,785,073	1,897,790	1,654,552	4,236,698	1,932,603	[6] 2,247,420	[7] 2,643,418	1,874,718	6,054,741
1954-55	803,541	1,821,087	1,943,822	1,657,844	4,822,492	1,960,536	[6] 2,283,660	[7] 2,596,719	1,874,943	6,119,139
1953-54	778,099	1,793,871	1,922,708	1,603,584	4,175,554	1,847,416	2,234,548	2,639,419	1,813,594	5,895,558

1/ Includes Government distribution. 2/ Total in mixtures and direct application materials. 3/ Including 2 percent of the colloidal phosphate and 3 percent of the phosphate rock marketed for direct application. 4/ Including 22 percent of the colloidal phosphate and 32 percent of the phosphate rock marketed for direct application. 5/ Data not available - estimated total plant nutrients in all fertilizers amounted to 700 tons. 6/ Revised by deletion of 702 tons of available P_2O_5 from the Pennsylvania total. 7/ Revised by deletion of 830 tons of total P_2O_5 from the Pennsylvania total.

NEWS about the TRADE



Hart Named MCA Chairman

Ernest Hart, president of Food Machinery and Chemical Corp., New York, was elected chairman of the board of directors of the Manufacturing Chemists' Association, Washington, D. C., at the association's 85th annual meeting at White Sulphur Springs, W. Va., June 6.

Harry B. McClure, vice president of Union Carbide Corp., New York, was elected chairman of the executive committee and Gen. J. E. Hull, full time president and a director, was re-elected.

Among the directors elected at the meeting were Curtis W. Cannon, president of Frontier Chemical Co., Wichita, Kans., and S. B. Penick, Jr. The New York Quinine and Chemical Works, Inc. (president, S. B. Penick & Co.).

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Cornell Symposium Oct. 4

The 75th Anniversary Symposium of the New York State Agricultural Experiment Station, Cornell University, will be held at Geneva, N. Y., on Oct. 4, 1957. The subject of the symposium will be, "The Role of Agriculture in Future Society."

Among the topics to be discussed are: Atomic Energy and the Future of Agriculture, Radiation Preservation of Food and its Effect on Agriculture, Food Processing and the Future of Agriculture, The Developing of Future Food Crops, and Agriculture and the Industrialization of Photosynthesis. New York's Governor Averell Harriman is scheduled to address the meeting.

Heads Grace Chemical Co.

William J. Haude has been appointed President of Grace Chemical Co., Division of W. R. Grace & Co., New York. Mr. Haude has been vice president and general manager of Grace Chemical Co., located in Memphis, Tenn., since 1955.

He is a director of Chemagro Corp., New York, and Central States Fertilizer Co., Chicago. Mr. Haude is a member of the Entomological Society of America, the American Chemical Society, the Farm Chemurgic Council, and the Chemists' Club.

•

Ford Named Asst. Manager

Jay B. Ford, Jr., has been appointed assistant general manager of the Pacific Coast Borax Division of United States Borax & Chemical Corp., New York.

Mr. Ford, whose headquarters are in New York, is generally responsible for administrative and executive functions within the division. He was formerly with the United States Potash Company division, where he had been assistant treasurer and subsequently assistant general manager.

Four V-C Regional Managers

John L. French, C. H. Godfrey, R. Andrew Jenkins, and Raymond T. Waller have been named regional sales managers of Virginia-Carolina Chemical Corp.'s Fertilizer Division. The new posts have been created in a reorganization of the company's fertilizer sales along regional lines.

Mr. French has moved from the general sales department to Albany, Ga., to head the Southeastern region. Mr. Jenkins assumes the duties of Southwestern regional manager with headquarters in Memphis. The Western district is managed by Mr. Godfrey who is based in Cincinnati. Mr. Waller is operating out of Richmond as Eastern regional manager.

•

Diamond Names Five

Five men have been appointed to sales positions by the Diamond Black Leaf Co., Cleveland, Ohio.

Norman D. Thomsen has been named staff assistant to commercial sales in the company's general sales office in Cleveland. Edward R. Luoma and Wayne H. Town have been named salesmen in the Midwest, with headquarters at Des Moines, Iowa.

Harold A. Branson is now sales supervisor for Black Leaf's Eastern sales district, Richmond, Va,. and Billy E. Hightower is a salesman in the new Southern sales district, Montgomery, Ala.

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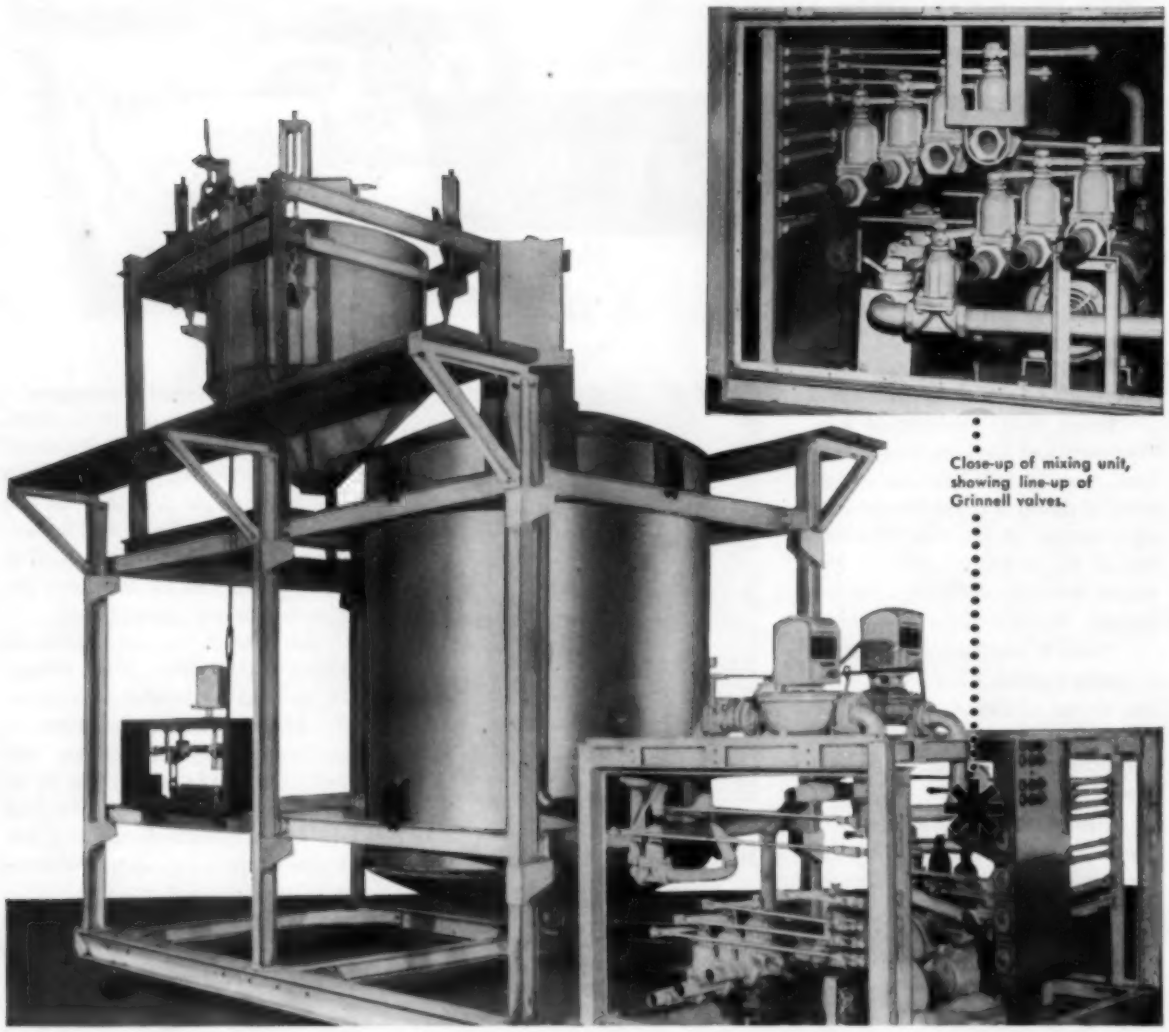
GPFES Visiting Ga. Farms

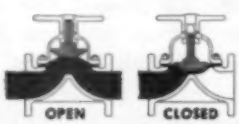
The summer meetings of the Georgia Plant Food Educational Society, Inc., are being held at the farms of four of the winners of the



Close-up of mixing unit, showing line-up of Grinnell valves.

Liquid Fertilizer Mixing Plant Relies on GRINNELL-SAUNDERS DIAPHRAGM VALVES

As original equipment on Standard Steel Mfg. Co.'s efficient liquid fertilizer mixing plant are 14 quick-acting Grinnell-Saunders Diaphragm Valves. The choice of these valves was dictated by a number of important considerations. The quick shut-off feature of the ¼-turn Grinnell-Saunders valve was one. But most persuasive was the design principle of this diaphragm valve. The diaphragm of the Grinnell-Saunders valve absolutely isolates operating mechanism from corrosive fluid in the line. This resilient diaphragm assures leakproof closure, even if grit or scale are in the line. Maintenance, too, is simple. The diaphragm may be replaced without removing the valve from the line. No refacing or reseating is necessary.



Bodies are of cast iron (plain or rubber lined), aluminum, stainless steel; diaphragms are of rubber, neoprene, or other synthetics. For further facts, write Grinnell Company, Inc., 235 West Exchange St., Providence, Rhode Island. Branches in principal cities.

GRINNELL-SAUNDERS DIAPHRAGM VALVES

Georgia Grazing System and Feed Production contest during this month.

The meetings include a tour of the farm and a study of farm management and fertilizer practices. W. A. Sutton, director of the Agricultural Extension Service, University of Georgia, presents the awards made to the winning farms during the tours.

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Spencer Fertilizer Unit

A pilot fertilizer mixing plant for research and demonstration has been officially dedicated by the Spencer Chemical Co., Kansas City, Mo. The new plant is located at Spencer's Jayhawk Works near Pittsburgh, Kans.

The plant is being used to develop research work on mixed fertilizer processing and make information available to all fertilizer manufacturers through demonstration and reports.

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3 New Glyodin Label Claims

Three new label claims are being made for glyodin, a fruit fungicide manufactured by the Union Carbide Chemicals Co., division of Union Carbide Corp., New York.

The claims are supported by evidence from agricultural experiment stations throughout Eastern apple-growing areas. The claims hold that glyodin gives lasting protection against apple scab even through prolonged rainy periods, it leaves an almost invisible residue on leaves and fruit, and it does not injure honey bees.

•

Ware Is IM&CC Director

Thomas M. Ware, administrative vice president of International Minerals and Chemical Corp., Chicago, has been elected a director of the company. He fills the vacancy created by the retirement of David M. Milton, who served on the board for the past 15 years.

Also elected by the board were: Dr. Milton LeBaron, vice-president in charge of research; William Bellano, vice-president in charge of engineering; and Anthony E. Cascino, vice-president in charge of marketing.

New Calspray Agronomist

Dr. Lowell G. Nelson has been appointed to one of the new district agronomist's positions of the California Spray-Chemical Corp., Richmond, Calif.

Dr. Nelson is with the research staff at the company's Portland office. Before joining Calspray, he was with the agronomy department of Washington State college where he was engaged in extensive soil testing, forage crop fertilization, field fertilizer trials, and fertility research programs.

•

Alco Offers Fly Bait

Alco Chemical Co., Artesia, Calif., is offering a fly bait known al Alco "Kwik-Kill," which contains DDVP and diazinon and is recommended for both residential and commercial use.

Kwik-Kill is packed in eight-ounce sift-top containers for home use. Commercial packages are available in one pound sift-top containers and seven pound cans.

It is claimed that one pound of Kwik-Kill, used under optimum conditions, has a maximum potential "kill" of 2,500,000 resistant or non-resistant house flies. The product is also effective in killing ants and cockroaches.

•

Magness Joins U. S. I.

Robert M. Magness has been named assistant to the manager of heavy chemical sales for the U. S. Industrial Chemicals Co., Division of National Distillers and Chemical Corp., New York.

Mr. Magness is assisting in sales of U. S. I. fertilizer raw materials, including ammonia, nitrogen solutions, sulfuric acid, and phosphatic fertilizer solution.

•

Diamond Grant To K-State

Research at Kansas State College, Manhattan, Kans., on use of fumigants to control insects attacking stored grains will be furthered with a $7,500 grant from Diamond Alkali Co., Cleveland.

The award, to the department of entomology of the Kansas agricultural experiment station at this college, will be used for research concerned with new combinations of presently used fumigants, and with new formulations. Methods of evaluating and testing fumigants also will be studied.

•

'58 Horticultural Congress

The 14th International Horticultural Congress will be held in Nice, France, on the Cote d'Azur, from April 11 to 18, 1958. Henri Queuille, president of the National Horticultural Society of France, and a former Premier of France, will be the president of the congress.

The theme of the meeting is to be, "Science in the Service of Horticultural Techniques."

The congress will include discussions, meetings of the various sections, social functions, and local excursions before and after the congress.

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'56 Fertilizer Imports Off

The dollar value of 1956 chemical imports into the U. S. was $273.9 million, up 7.5% from 1955. Fertilizer imports, however, dropped by some $8 million in 1956, undoubtedly reflecting the plentiful supply and static demand on the domestic scene.

Despite the drop, compounded fertilizers ran $1.3 million ahead of 1955 for a 102% rise. Ammonium sulfate imports totalled 197,650 short tons; this was a sizable increase of 14%. Calcium nitrate and prepared mixtures also gained slightly. The big volume items, however, such as sodium nitrate, ammonium phosphates and calcium cyanamid, were down about 18% each.

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AP&CC Ups Trona's Capacity

The American Potash & Chemical Corp., Los Angeles, is doubling production capacity of granular potash at its Trona, Calif., plant.

The project — which will cost approximately $750,000—is part of the company's current $3,500,000 improvement program at the Trona plant. Installation of the new potash granulating units is being done in two parts, with the first half now nearing completion and the final half scheduled to be completed by the end of 1957.

For greater yields, fewer complaints stress early production of cotton!

Toxaphene Is the Keystone of a Successful Cotton Insect Control Program In Any Area

Cutworms, thrips, fleahoppers, overwintered boll weevils—ignored by many cotton farmers—can take the profit out of a crop early in the season, leaving the way open for hard-to-control infestations that may get out of hand later in the year.

Experts stress the value of early cotton production. They say a crop that matures early is money in the bank, leaves the farmer free to concentrate on a "bonus" from a profitable top crop. *Toxaphene is the indispensable insecticide—the keystone—for a well-planned insect control program because it kills all major cotton insect pests, helps keep fields free of infestations that can develop into real trouble in July and August.*

Farmers who follow a toxaphene program become repeat toxaphene customers—and for good reason! Toxaphene-treated fields produce consistently high yields year after year. Successful cotton growers tell us they make toxaphene the keystone of their insect control program.

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TOXAPHENE

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HERCULES POWDER COMPANY

INCORPORATED

970 Market Street, Wilmington 99, Delaware

Gibberellin Tested For Use On Edible Crops

ALTHOUGH within the past five months gibberellin has been offered for sale to backyard gardeners—in liquid form, tablets, and aerosol containers—its use by commercial food growers is not expected to come until late this year, according to *The Wall Street Journal*.

In a front page article in the June 7 issue, the Journal said that U. S. Food & Drug Administration technicians, in cooperation with manufacturers, are testing the use of gibberellins on edible crops. To date no harmful effects have been found and full-scale commercial use is expected to come as researchers perfect application processes.

Now producing the material, a white powder in pure form, are Eli Lilly & Co., of Indianapolis; Merck & Co., Inc., of Rahway, N. J.; Chas. Pfizer & Co., Inc., of New York; Abbott Laboratories of North Chicago; and S. B. Penick & Co., New York. In addition, American Cyanamid Co. of New York is producing gibberellin on a pilot-plant basis.

In the Coachella Valley of Southern California, a field test is underway on the Perlette variety of seedless table grapes. Gibberellin promises to eliminate hand harvesting by elongating the stems and loosening the grape clusters.

A full-scale field trial on cigar tobacco is scheduled for this spring and summer in Canada. Laboratory tests showed tobacco plants doubled in height and showed early budding during a 25-day treatment with twice-weekly spray application.

At Texas A. & M. College at College Station, researchers have been applying gibberellin to cotton plants. Applications have resulted in longer stems and there are indications that a six per cent increase in fibre length will result.

In one experiment at the Government's research station in Beltsville, Md., a two-year-old willow oak tripled in size in a year's time. Numerous timber growing concerns are interested in the tree work because initial results indicate that gibberellin may provide small trees at a quicker rate than presently available for reforestation purposes.

The vegetable crops department at the University of California reports that initial testing of carrots, beets, lettuce, and endive shows "seed production under conditions unusual for such production and earlier flowering."

An Imperial Chemicals test in England on pasture grass turned up three-tenths of a ton yield of hay per acre in the first cutting but a decrease in yield from the second cutting. An I. C. I. researcher thinks overall yield could be increased by more than one gibberellin application, but doubts if this would be economical. Tests have shown, however, that gibberellin forces pasture grass to start growing earlier in the spring and continue later in the fall.

Because gibberellin seems to supplant a portion of the cold requirement (many plants require a low temperature before flowering and fruit production starts), carrot seed production could be shifted further south than Oregon, Washington, and northern California. Also possible is the extension further south of the growing areas of fruit trees that require cold to stimulate fruit, such as peaches and apples.

Interest in gibberellin is worldwide, according to Eli Lilly. Among other requests for samples, the firm received a letter from A. L. Kursanow, director of the K. A. Timiriazev Institute of Plant Physiology, Academy of Sciences in Moscow.

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Chase Bag Names 3 To Board

The Chase Bag Co., Chicago, recently elected two company officers and a New York banker to membership on its Board of Directors.

Elected were William N. Brock, vice president and general sales manager; Leland S. Brown, vice president of the First National City Bank of New York, and Francis H. Ludington, Jr., vice president of Chase Bag in charge of production and engineering. These men are filling vacancies caused by retirement from the board of J. G. Byam and K. L. Allen. A third vacancy has existed since the death of C. R. Decker, Sr., last year.

Ad Award to IM&CC

The International Minerals and Chemical Corp., Chicago, was honored at the recent 15th Annual Chicago Federated Advertising Club Award dinner for the "best farm paper product-selling campaign in color." J. C. O'Brien, (left) president of CFAC and vice-president of Carson, Pirie, Scott & Co., Chicago department store, presents citation to William T. Dible, product sales manager for the Potash Division of IMC.

•

Monsanto Price Changes

Monsanto Chemical Co.'s Inorganic Chemicals division has announced price changes, effective July 1, on Lion pelleted ammonium nitrate fertilizer, Lion nitrogen fertilizer solutions, Lion aqua ammonia, and Lion commercial grade anhydrous ammonia.

Ammonium nitrate is now $68 per ton FOB shippers plants. Nitrogen fertilizer solutions are $128 per ton. Aqua ammonia is $91 per ton; and commercial grade anhydrous ammonia is $88 per ton.

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AP&CC Forms Liaison Unit

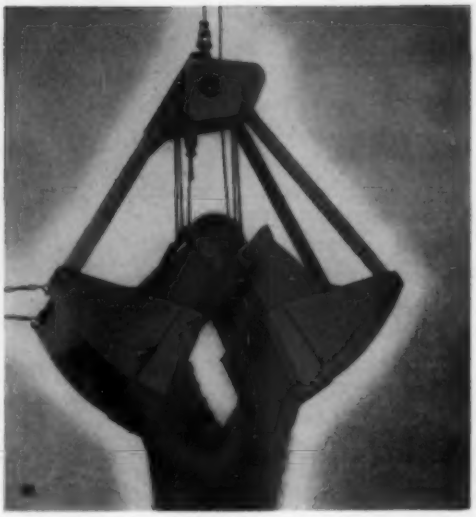
The American Potash & Chemical Corp., Los Angeles, has established a technical sales services section to act as coordinating unit among the company's production, market development, and sales departments.

Daniel A. Lundy, formerly western sales supervisor of boron and lithium products, is western manager of the new section, while Nelson E. Wendt, previously head of northeastern sales, is eastern manager. They will operate from the company's Los Angeles and New York offices respectively.

ideas

for low-cost bulk-material

- **STORAGE**
- **CHARGING**
- **BATCHING**
- **BLENDING**

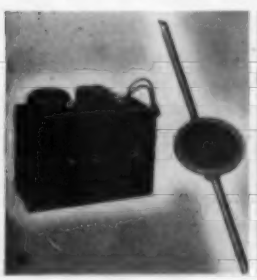


Fertilizer Buckets — To stockpile, load and unload bulk chemicals, fertilizers, and other fine-grained materials, Johnson brings you a special wide-rehandling clamshell bucket. All-welded, fast-filling, clean dumping. Tight closing lips prevent load leakage. Sizes — ½ to 3 cu. yds.

Pivoted Distributor
directs flow of materials into multiple-compartment bins. Turns and locks into position, controlled from ground level.

Rotary Vane Compressor
supplies 7 cu. ft. of air pressure per min. to aerate silos and bins. Limit-relief valve keeps pressure within 15 lbs.

Aeration Fittings
for storage silos, bins, keep bulk materials free-flowing. Moisture trap and pressure reducing valve are included.



Bin Gauge Signals
accurately indicate high-low level of storage bins, silos. Automatic signal box can be located wherever convenient.

Rotary Plug Valve
controls flow of finest materials from silo to screw conveyor. It's also efficient as fill valve on batchers.

Elevator Buckets
are all-welded, smooth, fast-filling, quick-dumping. Two types, 8 sizes. Steel chain has all carburized knuckles.

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Friedman Joins Emulsol

Sy Friedman has joined the sales staff of Emulsol Chemical Corp., Chicago, a division of Witco Chemical Co. Formerly with Stauffer Chemical Co., he is making his headquarters at Emulsol's general sales office in Chicago.

•

India Fertilizer Factory

The Sindri fertilizer factory, India, which was designed to produce 35,000 tons of ammonium sulphate annually, is the first major industrial project of the Government of India to be completed since the country's attainment of independence. The plant is the largest fertilizer factory in Asia and one of the world's most modern plants.

In the ammonia synthesis section of the plant, the converted gas from the gas plant is freed from the carbon oxides and the remaining mixture of nitrogen and hydrogen is synthesized under high pressure in the presence of a catalyst to form the ammonia. The plant is designed to produce 70 tons of ammonia per day.

Finely ground gypsum is mixed with a solution of ammonium carbonate in the sulphate plant to produce the ammonium sulphate which is crystallized and separated. The calcium carbonate sludge which remains behind as a by-product is utilized for the manufacture of cement.

Under its expansion scheme, financed and helped by the United States, Sindri will produce 70 tons of urea and 400 tons of ammonium sulphate-nitrate per day.

•

Du Pont Shifts Baenen

Eugene L. Baenen, formerly a sales representative in the Pacific Northwest for Du Pont nitrogen products for the fertilizer and feed industries, has been assigned to Charlotte, N. C., by the E. I. du Pont De Nemours & Co., Wilmington, Del.

In his new territory, which includes Virginia and the Carolinas, Mr. Baenen is sales representative for Uramon, NuGreen, Uramite, and Two-Sixty-Two feed compounds.

National Plant Food Institute Elects John A. Miller as President; 14 New Board Members

New Members of the Board: Nine of the 14 newly-elected members of the Board of Directors of the National Plant Food Institute are, left to right, (back row) Messrs. Thomas M. Ware, administrative vice president of International Minerals & Chemical Corporation; John L. Christian, vice president, Monsanto Chemical Company, Inorganic Chemicals Division; A. W. Mohr, president, California Spray-Chemical Corp.; Robert U. Haslanger, president, Escambia Chemical Corp.; Charles W. Baldwin, general manager of sales, United States Steel Corp.; T. F. Bridgers, president, Farmers Cotton Oil Company; and (front row) D. H. Banks, partner, Banks Fertilizer Co.; L. G. Black, president, Ark-Mo Plant Food Co.; and James E. Totman, president, Summers Fertilizer Company and Northern Chemical Industries, Inc. They were elected at the annual meeting of the Institute held at The Greenbrier, White Sulphur Springs, W. Va., on June 10. John A. Miller, Price Chemical Co., Louisville, Ky., was elected president of N. P. F. I.

(See page 34-38 for complete story.)

Ga. Fertilizer Conference

Georgia Fertilizer conferences will be held July 1 in Lexington; July 9 in Covington; July 11 in Thomasville; and July 12 in Tatesboro.

•

ASFFCO Elects Constable

The Association of Southern Feed and Fertilizer Control Officials elected Dr. E. W. Constable, State Chemist of the Department of Agriculture, Raleigh, N. C., president at its 15th annual convention in Birmingham, Ala., June 17 to 19.

More than 70 persons attended the meeting. Others elected by the convention were: Bruce Cloaninger, Department of Feed and Fertilizer Inspection and Analysis, Clemson, S. C., vice president; and Bruce Poundstone, Department of Feed and Fertilizer, Lexington, Ky., secretary-treasurer.

•

FES Meeting In Orlando

The Florida Entomological Society will hold its annual meeting in the San Juan Hotel, Orlando, Fla., on Sept. 11-13, 1957.

•

Terra-Lite Sales Head

Robert P. Arnold has been named Terra-Lite sales manager for the Zonolite Co., Chicago, miners and manufacturers of vermiculite. Mr. Arnold, who joined the firm in 1951, will maintain offices in Chicago.

Japanese Group Visits WARF

The Wisconsin Alumni Research Foundation, Madison, Wisc., recently was host to six members of a Japanese patent control specialist study team who were in this country to investigate the handling and management of patents in the U. S.

Carbide Appoints Cox

H. R. Cox has been appointed manager of the new Raleigh, N. C. experimental farm of the Union Carbide Chemicals Co., Division of Union Carbide Corp., New York.

Nitrogen Prices Up as Production is Kept Down

A VOLUNTARY slowdown of production by nitrogen producers in the U. S. over the first part of 1957 has substantially reduced the gap between output and consumption, according to statements in the half-yearly report of Aikman, London, Ltd. Actual output in the U. S. in 1955-56 was only 2.7 million metric tons, as compared with a capacity of 3.6 million tons estimated in the December, 1956 report by the London firm. Aikman further observes that the future of the world nitrogen market hinges on whether the United States is content to go on temporarily reducing its production, while at the same time increasing its capacity.

U. S. output during 1957-58 might be advanced to 3.9 million metric tons, Aikman estimates, but actual production will probably be based on requirements for consumption. The voluntary slowdown in operation, it is pointed out, has been due to the fact that producers were unable to dispose of the quantities they expected. Aikman states that if there is a normal increase in demand over the next few years of about five per cent, or 400,000 metric tons annually, present estimated capacity might be disposed of by 1961-62.

The Price Outlook

Last month, several producers of anhydrous ammonia reported price increases. The figure of $80 per ton is to be continued to October, at which time the price will be increased to $84 per ton, and on Jan. 1, 1958, it will be advanced to $88 per ton. The graduated scale is relatively common, since major producers have in the past tried to give manufacturers a price advantage by taking deliveries early in the season.

In connection with the price of ammonium sulfate, United States Steel Corp. announced recently it was extending its price of $32 per ton for the year starting July 1. The firm will accept contracts at this figure covering deliveries throughout the coming season. Annual consumption of ammonium sulfate is about a million tons.

Power-shifting makes this tractor shovel (a Michigan)

faster and more maneuverable in boxcars

If you've ever tried to shift gears and turn a corner at the same time, you'll understand why the job-proved Michigan Model 12B is faster and more maneuverable in tight quarters. You don't have to stop to shift the Model 12B. Without taking your left hand from the wheel, you simply push the single power-shift lever to High, Low or Reverse. Clark's exclusive power-shift transmission and torque converter eliminate clutch pedal and engine clutch. You have no reaching, no gear clash, no hesitation. You save seconds, even minutes, on every cycle. And you eliminate downtime due to burned facings and other clutch troubles.

Fingertip steering, no-clutch direction changes, and full heaped loads help the Michigan Model 12B unload boxcars quickly. Standard bucket holds 16 cu ft, interchanges with 6, 10, 20 and 27 cu ft sizes, with lift fork, and tine bucket.

Dust protection

To cut downtime still further, oil bath air cleaner, filters and sealed assemblies protect the Model 12B against dust and dirt in every conceivable way. Take a first-hand look at this modern Tractor Shovel—clip the coupon to your letterhead and we'll arrange a demonstration in your own plant.

Available on Clark's no-down-payment Lease Plan; write for Data Sheet 111.

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Palm Heads Cornell Station

Dr. Charles E. Palm, formerly head of the department of Entomology and Limnology at Cornell University, Ithaca, N. Y., has been named director of the Cornell University Agricultural Experiment Station and director of research for the New York State Colleges of Agriculture and Home Economics.

•

Strike Hits Nat'l. Potash

The National Potash Co.'s Carlsbad, N. M., mine was closed last month by a strike of members of the United Stone and Allied Products Workers of America (AFL-CIO).

The company stated that the strike was the result of failure to reach agreement on certain non-economic matters. Management is unable to predict the duration of the strike.

•

Hooker Integrates Sales

Hooker Electrochemical Co., Niagara Falls, N. Y., has integrated the sales of Oldbury Products into the Hooker chemical sales department under John S. Coey, manager of eastern sales.

Robert B. Boyd, formerly sales manager of Oldbury Products, has been appointed product manager of organic chemicals. Fred H. Berggren, who had been assistant sales manager, Oldbury Products, is now product supervisor, chlorate chemicals.

•

Azomite Claims Found False

A Federal Trade Commission hearing examiner recently found to be false the claims made by Azomite Utah Mining Co., Inc., Sterling, Utah, for the benefits of "Azomite" as a soil conditioner.

The examiner said that generally the use of Azomite will not aid in growing plants in poor soil, increase the resistance of plants to disease, or restore needed mineral to the soil.

•

SFFCO Meets At Birmingham

The annual convention of the Association of Southern Feed and Fertilizer Control Officials was held in Birmingham, Ala., June 17 to 19, and included a demonstration of production of granular superphosphate at Tennessee Valley Authority's pilot plant at Sheffield, Ala.

Paul Truitt, executive vice-president of the National Plant Food Institute, gave a report from the N.P.F.I. and Vincent Sauchelli, chairman of the chemical control committee of the N.P.F.I., spoke on "New Technologies but Same Old Chemical Control Problems in the Fertilizer Industry."

•

HR 8112 Excludes Pesticides

Rep. A. L. Miller last month presented congress with measure HR 8112, designed to strike a "balance of power between industry and the FDA." The bill requires that a firm pre-test any additives it proposes to place on the market. It must submit a report to FDA, but may call for help from an advisory committee of scientists. It would specifically exempt pesticides.

•

Potash Prices Cut

Contract prices for high grade muriate potash have been reduced by as much as $1.25 a ton. The reduction is announced in a revised price list by U. S. Potash Co., which supersedes and cancels the firm's price list of May 10th. The firm's new bulk price for June shipment is 34 cents, in contrast with 36¢ per unit of K_2O, or $22.50 per ton previously quoted; July shipments will be quoted at 34½¢; August through May, 1958, 35¢ per unit, and June 1958, 34¢.

•

N. C. State Agronomy Award

Howard G. Small Jr., a senior at North Carolina State College, received the college's 1957 Agronomy Achievement Award, consisting of $200 in cash and an engraved plaque. Louis H. Wilson, (second from left) of the National Plant Food Institute, the award donor, made the presentation. Looking on are Dr. Homer C. Folks, (left) in charge of soils teaching and student placement at the college, and Dr. J. W. Fitts, head of the college's soils department.

La. Cotton Checkers School

The third annual Cotton Checkers School was held in West Monroe, La., on June 21 and featured a discussion of the hazards of the phosphate insecticides to commercial cotton checkers.

Dr. Charles S. Petty of the L.S.N. medical school disclosed that a program is being set up for collecting blood samples and analyzing them for cholinesterase.. Facilities were available at the meeting to take the blood samples of any checkers who had not already had them taken.

Other features of the program at the meeting were illustrated lectures on insecticides and a discussion of damage caused by various insects.

•

V-C Test Marketing Folex

The Virginia-Carolina Chemical Corp., Richmond, Va., is test marketing a new cotton defoliant, trade named "Folex," in Mississippi, Arkansas, Arizona, and California this season.

The defoliant, which is reported to give reliable, dependable defoliation regardless of weather or rankness of cotton, is a liquid concentrate which mixes readily with water. V-C is marketing the product through the agricultural chemicals section of its chemicals division.

•

Best Co. Appoints Rogers

Julian A. Rogers has been appointed a vice president in charge of production for the Best Fertilizers Co., Lathrop, Calif. Mr. Rogers also will be in charge of concluding contracts for construction of an anhydrous ammonia plant to be located adjacent to the company's present plant facilities at Lathrop.

DuPont Files Trademark Suit

A civil action to enjoin the Metol Co., New York, and Harvey Bernes, doing business under the name of Bernes Sales Co., New York, from use of the DuPont trademark "Karmex" in connection with the manufacture or sale of granulated superphosphates, has been filed in U. S. District Court for the Southern District of New York. "Karmex" is DuPont's registered trademark for its urea herbicides.

The complaint states that the defendants labeled granulated superphosphates with the trademark "Karmex" for sale in foreign countries.

•

Plan Nematode Quarantine

The U. S. Department of Agriculture has proposed a quarantine on Missouri, North Carolina, and Tennessee because of the presence of the soybean cyst nematode in those states.

The pest has been found in two counties in Missouri, two counties in North Carolina, and four counties in Tennessee. Since a public hearing on the quarantine was held in Washington, D. C., in January, the nematode has been reported present in Arkansas and Kentucky also. This makes it necessary to hold another hearing to consider the advisability of quarantining those states.

The soybean cyst nematode attacks the roots of soybeans and certain other crops, including annual lespedeza, common vetch, and snap beans. It made its first U. S. appearance in 1954. Before that time it was known only in Japan, Manchuria, and Korea.

A Correction

On page 32 of the May issue of *Agricultural Chemicals*, the photograph of corn kernels infested with khapra beetles was credited to the U. S. D. A. The photograph was actually taken by Kenneth Middleham, staff photographer of the Riverside campus of the University of California.

Green Cross Names Six

The Green Cross Products Division, Sherwin-Williams Co. of Canada, Ltd., producers of agricultural chemicals and household pesticides, has announced the following appointments: J. K. Brown is assistant general manager; A. L. Havard is general sales manager; E. W. Syme is assistant general sales manager; E. S. Jonasson is western district manager; E. Lindenbach is assistant western district manager; and K. W. Dash becomes advertising manager.

Mr. Brown, Mr. Havard, Mr. Smye, and Mr. Dash are located at the company's main office in Montreal and Mr. Jonasson and Mr. Londenbach are at the Green Cross office in Winnipeg.

•

Army Enlists Industry Aid

The aid of industry is being enlisted by the U. S. Army Chemical Corps in its efforts to find new chemical compounds, processes, and information, which can be used in its research on chemical warfare agents.

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The Industrial Liaison program, under which such aid is invited was described by Dr. E. A. Metcalf of the Army Chemical Corps to members of the Armed Forces Chemical Assn. at the Sheraton Park Hotel, Washington, D. C., May 22.

Dr. Metcalf stated that the program has proven mutually beneficial both to cooperating companies and the Chemical Corps.

•

SWFC In Galveston July 17

The Southwestern Fertilizer Conference and Grade Hearing will be held in the Buccaneer Hotel, Galveston, Texas, from July 17 to 19 and will feature an address by Dr. Russell Coleman, executive vice-president of the National Plant Food Institute.

The planning committee for the conference is comprised of: Mr. & Mrs. Stanley Hackett, Dixie Fertilizer Co., Shreveport, La.; Mr. & Mrs. W. S. Tyler, Longhorn Construction Co., Sulphur Springs, Tex.; Mr. & Mrs. Don Miller, Armour Fertilizer Works, Houston; Mr. & Mrs Harold Trammell, Farmers Fertilizer Co., Texarkana, Tex.; Mr. & Mrs. J. D. Dawson Jr., Fidelity Chemical Corp., Houston; Dr. & Mrs. J. F. Fudge, State Chemists, Texas; and Mr. & Mrs. Jack Lindsey, International Minerals & Chemical Corp., Shreveport.

The annual Grade Hearing will be conducted by Dr. J. F. Fudge and control officials from Arkansas, Louisiana, New Mexico, Oklahoma, and Texas will participate.

•

Hercules Renames Works

The Hercules Powder Co., Wilmington, Del., has changed the name of its Missouri Ammonia Works at Louisiana, Mo., to the Missouri Chemical Works. Production of pentaerythritol and formaldehyde has been added to anhydrous ammonia production.

•

Arnell Joins Frontier

Arthur F. Arnell has joined the Frontier Chemical Co., Wichita, Kan., as a sales representative for the Minneapolis - St. Paul territory. He replaces John B. Childress who has been named product manager of industrial chemicals for Frontier.

Mr. Arnell had previously spent four years with the Shell Chemical Corp. He is now making his headquarters in Minneapolis.

WARF Names Stone Director

Phillip V. Stone has been named director of the Insecticide Division of the Wisconsin Alumni Research Foundation laboratories at Madison, Wisc. The Insecticide Division is a leading independent laboratory in the screening of new materials for insecticidal activity and testing of formulated insecticide products.

Mr. Stone succeeds Dr. George S. Kido, who is leaving to accept a position with the West Coast division of O. M. Scott & Sons Co.

•

Fisher Is Re-Elected

Wendy Fisher, Paramount Pest Control Service, Portland, Ore., was reelected president of the Pacific Northwest Pest Control Operators Association at the group's eighth annual conference in Portland recently.

Named association secretary at the meeting was Merle Weaver, Weaver Exterminating Service, Portland.

•

Plan Sulphur Plant

Plans are being made for the building of a sulfur extraction plant near the Okotoks field in Alberta, Canada, according to a joint announcement by the Shell Oil Co. and Devon Palmer Oils.

•

Chapin Names Two Agents

The E. H. Koepke Co., Cleveland, and the Johnston Co., Pittsburgh, have recently been appointed by the R. B. Chapin Manufacturing Works, Inc., Batavia, N. Y., as Chapin representatives. Chapin makes sprayers and dusters.

Koepke are representing Chapin in Ohio and Kentucky while Johnston is handling the territory of Western Pennsylvania and West Virginia.

•

Diazinon O.K. on Fruit

Geigy Agricultural Chemicals, division of Geigy Chemical Corp., Ardsley, N. Y., has announced that diazinon insecticides are now approved for use on fruit.

Diazinon has been field tested throughout the U. S. and Canada for the past four years and controls practically all major fruit pests on apples, pears, and cherries. It may be applied up to 14 days before harvest. Diazinon has been sold in Europe for control of fruit pests for the past two years.

A combination Diazinon-DDT spray controls practically all major fruit insects and also suppresses mite infestations.

•

Far East Fertilizer Plants

The fertilizer industry in the Far East is continuing to expand according to reports from India, South Korea, and China. Two new nitrogenous fertilizer factories are to be built near Bhakra Nangal and Rourkela, India. A factory is already in construction near Chungju, South Korea, and another is planned. Under China's second five-year plan, it is proposed to increase the production of fertilizers by five per cent, attaining an output of approximately 3,000,000 tons per year by 1962.

•

Explain Monsanto Blast

A falsely low temperature reading on a reactor vessel during a chlorination step has been blamed for the April 16 explosion at Monsanto Chemical Co.'s Nitro, W.Va., plant which took the lives of eight workers and destroyed a methyl parathion production unit, according to the findings of an investigating committee.

Monsanto announced last month that new plant facilities for methyl parathion are under construction at its Anniston, Ala., plant to supplant output of the destroyed unit at Nitro. Completion is scheduled for late fall. The company said that the decision to move the production of methyl parathion to Anniston was dictated by the availability there of chlorine and caustic raw materials, formerly freighted to Nitro, and a much closer proximity to the citrus and cotton growers who are major customers for methyl parathion.

The low reading on the faulty instrument at Nitro had apparently led operators to shut off the coolant supply, which precipitated the explosion. An examination of the scene indicated that the coolant was turned off to permit work on the instrument, under repair at the time of the explosion.

24th

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Ten Visit AP&CC Plants

Ten representatives of the Pacific Northwest pulp and paper industry made a flying trip to Southern California recently to view American Potash & Chemical Corp. facilities at Trona, Calif., and Henderson, Nev.

The three-day tour was hosted by AP&CC to acquaint the visitors with production operations at the two plants which supply chemicals used in pulp and paper manufacturing.

Among the guests were Earle Berger and Jack M. Lamb, of St. Regis Paper Co.; Dean Bostwick, Simpson Paper Co.; Harry R. Brayne and R. M. Inkster, of Weyerhaeuser Timber Co., and Leonard Frank, of Crown-Zellerbach Corp. Also attending were Larry G. Harris and Earl Wright, of MacMillan & Bloedel, Ltd.; David McCutcheon, of Canadian Forest Products, Ltd., and Byron W. White, Fibreboard Paper Products Corp.

•

Carbide Plans New Lab

Union Carbide Chemicals Company, Division of Union Carbide Corp., New York, has approved plans to build a technical service laboratory on its Westchester County property near Tarrytown, N. Y. It is expected that the laboratory will be completed early in 1959.

•

DuPont Northwest Rep.

Lawrence J. Munzenmaier, a specialist in turfgrass management, has been assigned to the Pacific Northwest as a sales representative for Du Pont's nitrogen products.

•

Herman L. Steinberg Dies

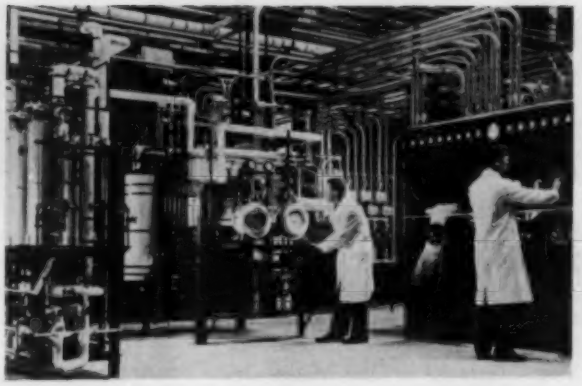
Herman L. Steinberg, of West Orange, N. J., died on June 13, several hours after he suffered a heart attack while playing golf. He was 51. Mr. Steinberg was a partner in the Rotenone Products Co. of East Orange, N. J., a firm which he and his brother Saul Steinburg founded 30 years ago.

•

Secretary Of U. S. Borax

W. A. Ackerman has been elected secretary of the United States Borax & Chemical Corp., Los Angeles.

Lummus Opens New Center



New engineering-development facilities, to bridge the gap from laboratory bench to full scale plants for the chemical and petroleum industries, were unveiled at Newark, N. J., recently by The Lummus Co., New York, engineers and constructors for the process industries.

The 150,000-square-foot center contains a number of schematic "building blocks," such as the ones illustrated, which verify engineering data on a pilot scale.

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Pikes Peak clay's exceptionally low moisture content and pH of 5 is your assurance of highest compatibility with malathion, methyl parathion, ethyl parathion or other phosphated insecticides.

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Equipment, Supplies, Bulletins

Terraclor Bulletin

A technical bulletin on Terraclor has been issued by the Olin Mathieson Chemical Corp., New York. Terraclor is Olin Mathieson's registered trade mark for pentachloronitrobenzene (PCNB).

A pioneer soil fungicide under development in the U. S. since 1950, Terraclor is available as a dust, wettable powder, and emulsifiable concentrate.

•

New Fertilizer Booklets

Fertilizer application is the subject of three new Farm Service bulletins offered to farmers, agents, and dealers in the Middle Atlantic area by the I. P. Thomas Division of Pennsalt Chemicals Corp., Philadelphia.

The bulletins — "Side Dressing Fertilizer," "Rotation Fertilization," and "Economics of Fertilizer Applications"—are part of a series offered by the company.

•

Weed Control Folder

Cornell Extension Bulletin 821, by M. M. Schreiber and S. N. Fertig, contains the 1957 Chemical Weed Control Recommendations from the Department of Agronomy of Cornell University, Ithaca, N. Y. Besides the weed control recommendations, the folder presents a defense of roadside spraying to control weeds along the state's highways.

•

Crag Mylone Folder

A new folder explaining how to use Crag Mylone is now available from the Union Carbide Chemicals Co., Division of Union Carbide Corp., New York. Mylone is a new, powdered soil fumigant that needs no plastic cover.

It is now commercially available as a pre-planting treatment on ornamental propagating beds. Experimental use of the product is continuing in many different states on tobacco, vegetable and forest-tree seed beds, and on turf.

Copies of the folder may be obtained from the company. To expedite requests, ask for F-40220.

•

African Pyrethrum Booklet

African Pyrethrum Development, Inc., New York, has issued a booklet describing the use of pyrethrum as a fly killer in dairy barns. Formulations containing pyrethrum are said to be equally effective in the form of sprays, fog, wettable powders, or emulsions.

•

Garden Maintenance Guide

A lawn and garden maintenance guide, which provides recommendations for controlling almost all common gardening problems involving insects, plant diseases, and weeds, has been issued by Diamond Black Leaf Co., Cleveland.

The large, illustrated chart is broken down into four major areas—lawns, trees and shrubs, bowers, and vegetables—and gives a quick, ready reference to symptom, cause, and cure of a particular plant malady.

•

Columbia-Southern Booklet

The Spring edition of Columbia-Southern "Chemicals," published by the Columbia-Southern Chemical Corp., Pittsburgh, Pa., contains an article about the development of agriculture from an ancient art to a modern science.

The article traces agriculture's progress to keep pace with the rapidly growing demand for its products. "Now, for the first time in history," the article concludes, "man has the technical knowledge to permit him to produce agricultural commodities in excess of his needs for some time to come. This should certainly not be looked upon as an undesirable situation, but as a chance first, to be ready for the greatly increased demands certain to come with increasing population, and second, as an opportunity to divert more effort from the struggle to eke out life's necessities, and devote it instead to the other arts of civilization."

•

Shadowgraph Scale Brochure

The Exact Weight Scale Co., Columbus, Ohio, is offering an eight-page brochure on the company's Shadowgraph scales designed for use in the chemical industry. The booklet contains specifications and illustrations of 34 different models, ranging in capacities from 2,000 mg up to 100 pounds.

•

Clayton Steam Cleaner

A compact, new steam cleaner has been announced by the Clayton Manufacturing Co., El Monte, Calif. It has a 60 gallon capacity and is handy for light duty general utility cleaning.

A brochure describing the cleaner, the "Handyman 60," can be obtained from the company.

•

New Dryomatic Dehumidifier

The Dryomatic Corp., Alexandria, Va., has developed a new commercial industrial dehumidifier, the Dryomatic Model 105, which is an automatically regulated dual-tower unit which uses silica gel as its drying medium.

Designed primarily as a space dryer, it also will provide low dew point air for processing applications. The unit is self-contained and is furnished complete with humidistat control for fully automatic operation.

1957 Pesticide Handbook

The ninth edition of the Pesticide Handbook is now available from the College Science Publishers at State College, Pa. This year's edition contains reports on 6,234 trade names.

•

Chipman Miticide Bulletin

Chipman Chemical Co., Inc., Bound Brook, N. J., is offering a technical bulletin on "Chipman 6199," a miticide formerly called "Tetram 75." (See *Ag. Chem.* June, 1957, pgs. 40-41)

The bulletin covers Chipman 6199's use on cotton only and is available from the company.

•

New Stedman Fertilizer Cata.

A new 24-page 2-color catalog showing its complete line of equipment for the fertilizer industry has just been published by the Stedman Foundry and Machine Company, Aurora, Ind.

Included in this attractive new Stedman Catalog No. 515 are front and rear view machinery illustrations, foundation plans and complete information concerning Stedman's Granular Fertilizer Process, 4 lines of Batch Mixers, Continuous Ammoniators, All-Steel Mixing Units, Tailing Mills —both Hammer and Double Cage Types, and Vibrating Screens—single and multiple deck units. New machines, not shown in any other Stedman literature are included in this Catalog No. 515.

•

Vermiculite Folder

A new folder, "Granular Formulations With Vermiculite," issued by the Vermiculite Institute, Chicago, covers the preparation of granular insecticides, herbicides, and fungicides with vermiculite as the carrier.

The folder also contains helpful hints on handling and formulating specific products.

•

Wayne Hand Pump

The Wayne Pump Co., Fort Wayne, Indiana, is marketing a double action push-pull hand pump which dispenses liquids of almost any viscosity. It is said to assure safe, dry working areas where liquids are transferred by eliminating spilling, dripping, and over-filling.

•

New Clark Truck Catalog

The complete line of fork-lift trucks, straddle carriers, powered hand trucks, and towing tractors produced by the Industrial Truck Division of the Clark Equipment Co., Battle Creek, Mich., is described in a 16-page, four-color catalog recently published by the company.

Brass Valve Folder

A folder on brass composition-disc globe, angle, and lift check valves has been published by Crane Co., Chicago. The folder shows major design features of the valve lines.

•

Snell Research Booklet

Foster D. Snell, Inc., New York, has issued a booklet, titled "How to Develop Successful New Products," which explains the functions of the research firm and tells of some past problems solved by the company.

▸Ammoniators* ▸Coolers ▸Dryers
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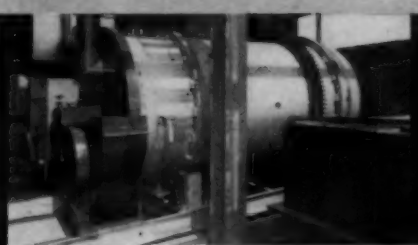
FOR THE FERTILIZER INDUSTRY



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Renneburg
DehydrO-Mat
Dryer

Built in a wide range of sizes, the DehydrO-Mat Dryer, though comparable in price, out-performs conventional dryers of similar volume. Compact, it is easy to install in a minimum of space. The varying diameter cylinder regulates air and material velocities . . . controls temperature drop and product retention time . . . assures gentle drying.

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BREVITIES

PERMACHEM CORP., West Palm Beach, Fla., has formed a new agricultural division under the direction of Dr. Carl E. Cericke and James L. Parnell to expand sales of Permachem products covering soil-disinfection, seed-disinfection, and crop sprays.

AC

AN APPEAL from a lower court decision in a patent infringement suit has been decided in favor of Rohm & Haas Co., Philadelphia, by the United States Court of Appeals for the Fourth Circuit.

This decision sustains the company's contention that the patent under which it sells its Dithane brand fungicide is being infringed by Roberts Chemical Co.

AC

COASTAL CHEMICAL CORP., Baltimore, Md., will offer $2.5 million in class C common stock with the proceeds to be used to help build the company's ammonia plant at Pascagoula, Miss. Total cost of the plant will be more than $5 million.

AC

THE CENTRAL FARMERS FERTILIZER CO., has started construction on a phosphate concentrating plant in Montpelier, Idaho. The plant is part of a project by which phosphate ores mined from the company's deposits in Georgetown Canyon, Idaho, will be made into high analysis fertilizers.

AC

THE FAIRFIELD CHEMICAL DIVISION of Food Machinery and Chemical Corp., New York, has appointed R. Larry Brett to the position of district manager for the company's Chicago office.

AC

THE COMPANHIA FABRIL COMMERCIAL DO ULTRAMAR, Angola, Africa, is planning to erect a fertilizer factory near Luanda, Angola. The plant would use natural gas and other by-products of Angola's future petroleum industry to manufacture about 40,000 tons of ammonia a year.

AC

EXPLORATION WORK conducted by the San Francisco Chemical Co. for Stauffer Chemical Co., New York, at Stauffer's Hot Springs, Idaho, phosphate rock property has indicated that the Stauffer reserves include at least a million tons of easily minable, high grade phosphate rock which can be used for the economic manufacture of superphosphates.

AC

THE AMERICAN AGRICULTURAL CHEMICAL CO., New York, has announced the following administrative changes: B. R. Richey was named vice president; W. J. Turbeville, Jr., was elected vice president—fertilizer sales; and D. S. Parham is vice president—production.

AC

THE THIRD ANNUAL Cornell Weed Day is scheduled for July 18 at Ithaca, N. Y., and will include agronomy and vegetable tours to the college's test plots.

AC

HERBERT H. HARRIS has been appointed to the technical staff of Diamond Alkali Co.'s Chlorinated Products division. Mr. Harris is concerned chiefly with technical service matters relating to Diamond insecticides as well as development of new agricultural chemicals. His headquarters are at the Diamond Research Center in Painesville, Ohio.

AC

THE UNION CARBIDE CHEMICALS CO., division of Union Carbide Corp., New York, has announced the reassignment of five technical representatives. A. A. Douglas has been assigned to the Albany district office, R. R. Failla to the Buffalo district office, H. R. Hubbs to the Charlotte district office, C. D. Schmidt to the Newark District office, and R. J. Spath to the Chicago district office.

AC

KRAFT BAG CORP., New York, has named three to sales position in the East and Mid-West. Robert T. Smith is operating from the Birmingham, Ala., office; R. A. Kurlander is now at the company's New York office covering New York State and New England; and R. F. Hobbs is handling sales in Northern Ohio and Michigan from the company's Chicago office.

AC

LOUIS H. WILSON, secretary and director of information of the National Plant Food Institute, Washington, D. C., was named one of ten "Friends of 4-H," during the 27th National 4-H Conference in Washington, June 15 to 21, for his "outstanding contributions to the nationwide development of the 4-H club program."

AC

COSTA RICA has prohibited import, sale, and use of mercurial fungicides for treating coffee diseases. Use of mercurial fungicides for experimental purposes must be authorized by the Costa Rican Ministry of Agriculture and Industry.

AC

DR. RICHARD B. WESSEL has been named to the position of field research supervisor — East — by the California Spray-Chemical Corp., Richmond, Calif.

AC

ERIC SHEPHARD, New South Wales veterinary officer of the Biologicals Division of Imperial Chemical Industries of Australia and New Zealand Ltd., is currently on a four-months tour of the major sheep and cattle producing countries in the world. He is studying the problems and trends of the cattle and sheep industries.

AC

RICHARD F. STEEL has been appointed assistant general manager of the United States Borax & Chemical Corp., Los Angeles. The position is a newly-created post in the organization.

THE INDUSTRIAL TRUCK DIVISION, Clark Equipment Co., Battle Creek, Mich., has named two product sales managers. Phillip E. Campbell was appointed sales manager of the gas truck section and John Borman was named sales manager of the attachments section.

AC

BERKELEY CHEMICAL CORP., Berkeley Heights, N. J., has completed new facilities for the production of cuprous chloride. The new plant doubles the company's capacity.

AC

GEORGE LOFT, director of the public relations department of the Atlas Powder Co., Wilmington, Del., is leaving the company to undertake a special overseas mission for the American Friends Service Committee, an international Quaker organization.

AC

THE MINERALS & CHEMICALS CORPORATION OF AMERICA, Menlo Park, N., J., has published a technical bulletin on additives for corrugating, laminating, tube winding, and bag seam adhesives.

AC

WILLIAM J. RIES has become a member of the sales department of Monsanto Chemical Co.'s Organic Chemicals division at St. Louis.

AC

DONALD S. TAYLOR has been elected vice president in charge of research of the United States Borax & Chemical Corp., Los Angeles. He succeeds G. A. Connell, who has retired.

AC

HANS W. HUBER has been elected Chairman and Michael W. Huber, President, of the J. M. Huber Corp., New York.

AC

JOHN B. CLOPTON has joined the Escambia Chemical Corp., New York, and is devoting his activities to commercial development and the sales of ammonia products and methanol.

AC

THE MEXICAN MINING DEVELOPMENT COMMISSION has approved a transfer of a sulfur mining concession from Pan American Exploration Co. to Gulf Sulphur Corp.'s Mexican subsidiary. The concession covers about 7,000 acres on the Isthmus of Tehuantepec. It could add substantially to Gulf's proved Mexican reserves of more than 13 million long tons of sulfur.

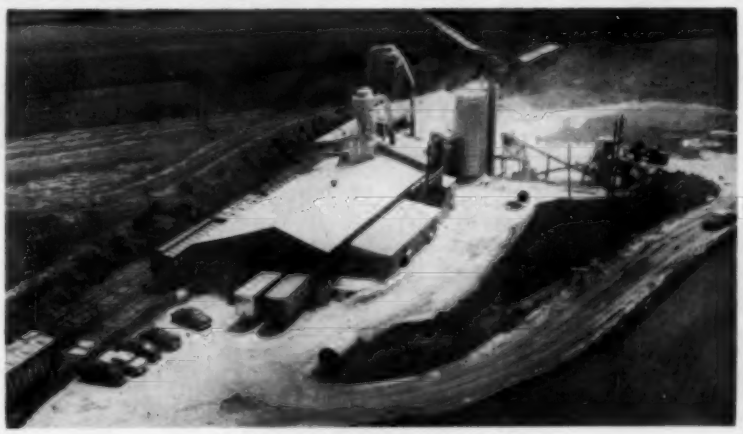
AC

R. M. ROACH has been named New York district sales manager of Jefferson Chemical Co., New York. In other personnel moves announced by the company, R. J. Robinson was transferred from Cleveland to the New York office and J. M. Luger moved from Houston to Cleveland.

THE AMERICAN AGRICULTURAL CHEMICAL CO., New York, has transferred John A. Layton, formerly superintendent of the Baltimore works, to the production department of the New York office. Harry M. Rau, formerly assistant superintendent of the Carteret works, replaces Mr. Layton at Baltimore.

AC

MISS KATHLEEN A. MEISKY has joined the research department of Monsanto Chemical Co.'s Organic Chemicals division at St. Louis.



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Processed from Sericite ore, **SER-X** has an average particle size of 3.5 microns and a bulk density of 40 pounds per cubic foot. **SER-X** is inert, non-hydroscopic and non-shrinking. The particles are flat. Because of these physical and chemical properties it has proved ideal as a diluent in the formulation of agricultural insecticide dusts.

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Table 6a.

Percent of increase or decrease in consumption of primary nutrients — year ended June 30, 1956 as compared with preceding year.

Region	N		Available P_2O_5		Total P_2O_5		K_2O		Total (N, avail. P_2O_5, K_2O)	
	Mixtures	Materials	Mixtures	Materials	Mixtures	Materials	Mixtures	Materials	Mixtures	Materials
New England	+ 0.25	— 7.14	— 0.31	— 2.51	— 1.34	— 4.11	— 4.78	—15.87	— 2.03	— 5.69
Middle Atlantic	— 5.85	—13.11	— 7.22	— 7.78	— 7.18	— 9.38	— 4.65	— 1.29	— 5.98	— 9.83
South Atlantic	— .99	— 5.13	— 1.55	+ .27	— 1.40	+ 7.27	+ 1.10	— 6.76	— .38	— 4.88
East North Central	+ 5.74	— 7.88	— 2.26	+ 2.74	— 2.78	+32.57	— 2.56	+ 2.84	— 1.38	— 1.78
West North Central	— 9.53	—16.27	— 6.90	— 5.87	— 8.22	+15.96	+ 1.46	+ 6.12	— 4.86	—11.01
East South Central	+ .63	+ 3.27	+ 2.53	— 1.91	+ 1.94	+ 2.36	+ 5.48	— 3.18	+ 3.28	+ 1.46
West South Central	+ 7.23	+10.86	+ 8.71	+ 4.34	+ 8.23	+ 4.17	+ 7.00	+11.33	+ 7.84	+ 9.15
Mountain	— 1.95	— 2.86	— 4.44	+ 1.21	— 5.31	.19	+ 6.70	+31.26	— 2.41	— .86
Pacific	+ 1.04	+ 5.28	+ 7.80	+ 7.13	+ 7.51	+ 6.12	+14.92	— 2.43	+ 6.92	+ 5.37
Continental U. S.	— .43	— 1.66	— 1.94	— .11	— 2.32	+14.18	— .03	+ .98	— .92	— .95
Territories	—10.82	— 7.94	— 5.79	+ 7.92	— 7.72	+18.04	— 7.83	+ 6.97	— 8.60	— 3.56
United States & Territories	—10.82	—16.27	—12.41	—14.37	— 2.37	+14.20	— .18	+ 1.24	— 1.07	— 1.01

FERTILIZER REPORT

(From Page 45)

multiple-nutrient materials averaged 22.71 percent. The corresponding averages for these classes in 1954-55 were 31.00, 19.37 (revised), 54.56, and 21.64 percent. That the national averages for most of the classes were higher in 1955-56 than in the preceding year reflects generally the greater use of the higher analysis products. The lower average for available P_2O_5 results from the large increase in the tonnage of phosphate rock which contains only 3 percent of available P_2O_5.

Primary Nutrients

THE quantities of primary nutrients in fertilizers are based on the average analyses of samples of the various products as published by fertilizer control official for the State in which they were consumed, rather than on the manufacturers' guarantees. Thus, the overruns or underruns of nutrients from the guarantees are taken into account. This gives more nearly the actual tonnages of nutrients than would be the case if only the guarantees were used. The actual nutrient content usually averages somewhat higher than the guarantee.

In 1955-56 the primary content of fertilizers (mixtures and direct application materials) comprised 1,932,603 tons of nitrogen, 2,247,420 tons of available P_2O_5 (2,643,418 tons of total P_2O_5), and 1,874,718 tons of K_2O (table 6). Compared with the preceding year, consumption of these nutrients decreased by 27,933 tons (1.42 percent) of nitrogen, 36,240 tons (1.59 percent) of available P_2O_5, and 225 tons (0.01 percent) of K_2O, while total P_2O_5 increased 46,699 tons (1.80 percent). Although the consumption of fertilizers bearing these nutrients in 1955-56 was 2.42 percent below that in 1954-55, the total quantity of the nutrients (nitrogen, available P_2O_5, K_2O) themselves was only 1.05 percent lower.

Mixed fertilizers suppled 41.22 percent of the nitrogen, 79.43 percent of the available P_2O_5 (71.79 percent of the total

(Continued on Page 98)

Table 6b.

Nitrogen consumed in direct application materials — Years ended June 30, 1955 and 1956.

Material	Nitrogen, year ended June 30		Change
	1955	1956	
	tons	tons	tons
Ammonia, anhydrous	290,337	343,578	+ 53,241
" , aqua	46,617	62,510	+15,893
Ammonium nitrate	375,318	316,964	—58,354
Ammonium nitrate-limestone mix.	73,753	64,776	— 8,977
Ammonium sulfate	109,245	86,878	—22,367
Calcium cyanamide	14,121	13,515	— 606
Calcium nitrate	8,667	8,630	— 37
Natural organic materials	13,804	13,204	— 600
Nitrogen solutions	38,362	34,493	— 3,869
Phosphate materials	52,973	56,976	+ 4,003
Potash materials	2,525	3,153	+ 628
Sodium nitrate	99,463	87,699	—11,764
Urea	30,973	41,785	+10,812
Other chemical nitrogen materials	837	1,769	+ 932
Total	1,156,995	1,135,930	—21,065

Table 6c.

Available P_2O_5 consumed in direct application materials—years ended June 30, 1955 and 1956.

Material	K_2O, year ended June 30		Change
	1955	1956	
	tons	tons	tons
Ammonium phosphate: 11-48	18,241	23,265	+ 5,024
" " : 13-39	14,574	16,568	+ 1,994
Ammonium phosphate-sulfate: 16-20	53,240	52,295	— 945
Basic slag	12,252	14,115	+ 1,863
Calcium metaphosphate	27,100	26,786	— 314
Diammonium phosphate: 21-53	1,508	7,523	+ 6,015
Natural organic materials	12,282	9,740	— 2,542
Phosphate rock & colloidal phosphate	17,924	27,757	+ 9,833
Phosphoric acid	7,669	7,513	— 154
Potash materials	211	73	— 138
Superphosphate: 22% and under	137,878	122,500	—15,378
" : over 22%	153,528	147,622	— 5,906
Other phosphates	6,166	6,588	+ 422
Total	462,573	462,347	— 226

SMUT CONTROL

(*From Page 43*)

In 1852-53 the seed treatment tests against *seed-borne* spores on both winter and spring wheat included 21 materials, some of which were applied at different rates. Smut infection in untreated rows ranged from 13 to 50 per cent in eight replications. The majority of the materials tested gave satisfactory control but the hexachlorobenzene 40 per cent formulation at one-half ounce to the bushel was again outstanding, being matched in performance only by pentachloronitrobenzene 75 per cent and dinitrofluorobenzene at higher rates of application, and by several experimental mercury compounds. It should be noted that in this test both hexachlorobenzene 25 per cent and pentachloronitrobenzene 20 per cent were significantly less effective at the same rates of application than the higher strength formulations.*

As mentioned above, the 1952-53 fungicide tests included an experiment designed to evaluate hexachlorobenzene and pentachloronitrobenzene as seed treatments against infection by *soil-borne* spores of common bunt of winter wheat. These plots were established in smut-contaminated soil at Pullman, Washington, and Moro, Oregon. The infection in rows planted to untreated seed ranged from 8 to 35 per cent. Hexachlorobenzene 40 per cent gave perfect control at rates of application ranging from one-half to eight ounces per bushel of seed. Pentachloronitrobenzene, in both 20 per cent and 75 per cent formulations, was likewise effective in reducing the amount of infection by soil-borne spores but was less effective than hexachlorobenzene except at the 8- and 4-ounce rates, respectively. These results heralded a discovery of unprecedented importance with respect to the chemical control of wheat smut in the Pacific Northwest because here were *seed treatment* materials that appeared to be effective simultaneously against both *seed-borne* and *soil-borne* spores. There was need for confirmation by further study, however, and this was forthcoming in the 1953-54 tests located at Pullman, Washington, and at Pendleton and Moro, Oregon.

Part 2 Next Month

* *Plant Disease Reporter* 37: 583-584, 1953.

DOW ET-57

(*From Page 45*)

ter a definite decrease had been noted on all ranches. The January check accounted for 11 per cent of the grubs in the untreated and for 17 per cent in the treated groups. The previous inspections, made in the last week of November and the first week of December, accounted for 40 and 48 per cent, respectively.

The ranchers were forced to sell a large number of the cattle or move them to distant pastures because of the drouth conditions. Data for individual animals that were lost before completion of the test were omitted, even though they were infested with grubs, as these counts could not be compared adequately with those of animals that were carried to com-

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Table 2.
Frequency distribution of total grub counts for all animals in test at completion of experiment.

Number of Grubs	Number of Animals		Number of Grubs	Number of Animals	
	Treated	Untreated		Treated	Untreated
0	51	11	11	1	3
1	24	7	12	3	2
2	8	5	13	0	8
3	7	5	14	0	3
4	4	4	15	0	4
5	2	3	16-20	0	13
6	0	3	21-25	1	4
7	v	10	26-30	0	7
8	0	4	31-35	0	2
9	1	4	36-40	0	2
10	2	3	53	0	1
			Total	105	108

pletion. Data for the Peril ranch were retained, as it was removed from the experiment as a unit, thus preventing further counts on any of the animals. One ranch was omitted completely, as the inspections were made at too widely spaced intervals to enable accurate counts to be kept. Other animals were lost as individuals from various herds, as the cattle-marking paint that was used initially did not furnish permanent identification.

At the experiment's termination, 94 cows and 33 yearling heifers remained in the untreated, and 90 cows and 33 yearling heifers in the treated group. Data are presented in Table 1.

Of the 46 heifer calves included originally in the experiment, only four untreated and seven treated animals remained at its conclusion. These averaged 12.2 and 1.6 grubs per animal, respectively, for a control of 86.9 per cent. Three untreated bull calves were used also, but two were sold in December, before the expected January increase in grubs could be tallied. When the data for bull calves, averaging more than 27 grubs per animal, were included, the overall calf control was greater than 91 per cent. Of the two yearling bulls that were treated, one bull developed 25 grubs and the other none.

The degree of control varied considerably on individual ranches. Excluding the Peril ranch, where the tests were not carried to completion, the greatest control was 94.3 per cent on the Schwethelm ranch when all types of animals were considered. The calf and bull data increased the control slightly except on the E. Henke ranch, where it lowered it slightly, and on the Kott ranch, where one treated bull with 25 grubs lowered the control from 98.2 to 62.8 per cent.

The frequency distribution of total grub counts for all animals that remained in test upon completion of the experiment is shown in Table 2. A much higher infestation had been expected. The 108 animals in the untreated group totaled 1444 grubs for an average of 13.4, and the 105 animals of the treated group had 195 grubs for an average of 1.8 per animal. The degree of control for these animals was 84.9 per cent. A statistical analysis of these data by paired numbers showed that the treatment was highly significant at the 1-per cent level.

The data for the treated group are what might have been expected, except that there was an increase at the 9-12 grub level. The inferior control on a few ranches was due primarily to the poor response of a few animals to the insecticide.

No reports of toxic effects were received from any of the ranchers. Weight records kept of the Schwethelm herd failed to indicate any significant effect upon weight gains.

Literature Cited

McGregor, W. S., and R. C. Bushland. 1957. Control of cattle grubs with a systemic insecticide. *Jour. Econ. Ent.* (In press).

Table 2.
Analyses of Residues After Extractions.

Material	Ratio solid/H_2O in 1st extraction gms/liter	P_2O_5 residue as % of original P_2O_5	CaO/P_2O_5 molar ratio
Monocalcium phos. $Ca(H_2PO_4)$	24.9	4.0	n.d.*
"	249.	14.5	1.96
Dihydrate Dical. phos. $CaHPO_4 \cdot 2H_2O$	.057	0.3	n.d.*
"	5.81	53.	2.27
Dicalcium phos. $CaHPO_4$	0.49	14.	n.d.*
"	4.91	85.	2.06
Hydroxyapatite $Ca_5(PO_4)_3 \cdot OH$	0.15	39.	n.d.*
"	1.53	89.	3.26

* n.d. = not determined.

CALCIUM PHOSPHATES

(*From Page 41*)

the first extraction, and values of the ratio CaO/P_2O_5 for some of the residues.

Monocalcium Phosphate: The residue from the higher solid to water extractions was predominantly $CaHPO_4 \cdot 2H_2O$ (monocalcium phosphate dihydrate) mixed with $CaHPO_4$ (dicalcium phosphate). The technique used could not detect hydroxyapatite if less than 10% were present. The $CaO:P_2O_5$ molar ratio confirmed that the residue was chiefly dicalcium phosphate, and it is probable that the residue in the low solid to water extraction was mostly dicalcium phosphate.

Of interest is the comparison between the decomposition of $Ca(H_2PO_4)_2$ and $Ca(H_2PO_4)_2 \cdot H_2O$ as reported by Sanfourche and Focet. Assuming it occurs as follows: $Ca(H_2PO_4)_2 \rightarrow H_3PO_4 + CaHPO_4 \cdot 2H_2O$ it is possible to calculate the amount of $Ca(H_2PO_4)_2$ which has decomposed from the amount of the dicalcium phosphate. Applying this reasoning to the data in Table 2, the amounts of decomposed $Ca(H_2PO_4)_2$ were not less than 8% and 29% of the total in the low and high solid to water extractions, respectively. Sanfourche and Focet found 6.7% and 32.3%, respectively, for comparable solid-to-water ratios when using $Ca(H_2PO_4)_2 \cdot H_2O$. It is reasonable to infer that little, if any, difference exists between the hydrated and anhydrous compounds when decomposing with water under the conditions of this test. It is also fair to conclude that the best figure for the maximal decomposition of $Ca(H_2PO_4)_2 \cdot H_2O$ —namely, 56.5% as given by Elmore and Farr * applies also to the anhydrous salt.

When monocalcium phosphate hydrated is put into the soil as a fertilizer, the limited amount of soil solution coming in contact with it may induce maximal decomposition. The reason for this expectation has previously been given in the discussion of P_2O_5 equilibrium in the soil and its solution. Dr. Raistrick concludes that the net potential fertilizing effect of monocalcium phosphate is equivalent to adding 72% of its P_2O_5 in a "stable" form (for example, an ammonium phosphate) and the remaining 28% as dicalcium phosphate, (that is one half the value, 56% decomposition as given by Elmore and Farr.★★

* See citation (2) previously given.

FERTILIZER VIEWS

(*From Page 50*)

is too often associated commercially with mere size and uniformity in grading and not necessarily with "goodness." This is not to disparage the value of "eye appeal" in marketing. But scientists should go deeper than appearance and determine the prime factors responsible for high nutritional quality in the interest of national health and vigor.

MODEL CSG

The FRY MODEL CSG is a semi-automatic closing machine that double-folds, heat seals the inside of the bag and glues the second fold to the first. The result is a neat closure... heat-sealed for sift-proofness and glued for additional shipping or carrying strength. Operation is continuous and no reciprocating or cyclic motions are employed.

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FERTILIZER REPORT

(From Page 94)

P_2O_5), and 88.28 percent of the K_2O. The respective quantities of these nutrients consumed as mixed fertilizers were 0.86, 1.98, 2.37, and 0.18 percent lower than in the preceding year. While the tonnage of mixed fertilizers in 1955-56 was 3.73 percent lower than that in 1954-55, the total quantity of nutrients (N, available P_2O_5, K_2O) contained therein was only 1.07 percent lower.

Fertilizer materials for direct application supplied 58.78 percent of the nitrogen, 20.57 percent of the available P_2O_5 (28.21 percent of the total P_2O_5), and 11.72 percent of the K_2O. The quantities of nitrogen and available P_2O_5 consumed as fertilizer materials were, respectively, 1.82 and 0.05 percent lower, while the quantities of total P_2O_5 and K_2O were, respectively, 14.20 and 1.24 percent higher than in the preceding year. Although the tonnage of materials bearing these nutrients increased 0.62 percent over that in 1954-55, the total quantity of nutrients (N, available P_2O_5, K_2O) supplied thereby decreased 1.01 percent. In 1955-56 the increased consumption of phosphate rock was largely responsible for the increase in the tonnage of materials and of total P_2O_5. The phosphate rock used for direct application averages 32 percent total P_2O_5 but only 3 percent available P_2O_5.

The percentage difference in the quantity of primary plant nutrients in fertilizer mixtures and materials used in 1955-56, as compared with the quantity in the preceding year, is shown by regions in table 6a. The West South Central region was the only region in which increases occurred in the quantities of each of the nutrients in both mixtures and materials. In 1955-56 the total quantity of primary nutrients in the mixed fertilizers used in the United States and Territories decreased 1.07 percent; nitrogen, available P_2O_5, and K_2O decreased 0.86, 1.98, and 0.18 percent, respectively. In the case of fertilizer materials the total quantity of nutrients decreased 1.01 percent; nitrogen and P_2O_5 also decreased—1.82 and 0.05 percent, respectively—but K_2O increased 1.24 percent.

Table 6d.

K_2O consumed in direct application materials—years ended June 30, 1955 and 1956.

Material	Available P_2O_5 year ended June 30		Change
	1955	1956	
	tons	tons	tons
Cotton hull ashes	279	368	+ 89
Lime-potash mixtures	1,477	1,418	— 59
Manure salts	551	246	— 305
Natural organic materials	7,789	5,838	— 1,951
Potassium chloride	190,258	194,754	+ 4,496
" magnesium sulfate	1,418	1,480	+ 62
" sodium nitrate	1,996	2,518	+ 522
" sulfate	12,764	12,826	+ 162
Wood ashes	144	129	— 15
Other potash materials	403	89	— 314
Total	217,079	219,766	+ 2,687

Table 7. - Weighted average primary plant nutrient content of fertilizers, in percent, year ended June 30, 1956 1/

State and Region	Mixtures 2/				Materials					Average nutrient content of mixtures and materials
					Single nutrient 3/			Multiple nutrients 4/		
	N	Available P_2O_5	K_2O	Average nutrient content	N	Available P_2O_5	K_2O		Average nutrient content	
Maine	7.65	11.50	12.42	31.57	29.80	20.26	55.77	20.14	23.75	31.35
New Hampshire	6.32	12.75	13.52	32.60	27.59	20.02	55.08	11.28	21.40	29.75
Vermont	5.90	15.74	16.86	38.50	32.80	21.04	59.42	11.46	22.04	31.33
Massachusetts	6.54	9.84	9.69	26.07	18.27	19.11	58.80	10.95	16.35	24.01
Rhode Island	5.60	10.27	10.49	26.36	19.40	19.37	59.02	9.95	16.49	25.20
Connecticut	6.18	9.38	10.25	25.81	22.97	23.79	56.89	12.69	18.90	23.71
New England	6.77	11.29	12.01	30.07	23.03	21.28	57.68	12.26	19.60	28.35
New York	6.24	11.74	9.84	27.82	25.76	20.28	54.11	9.71	20.69	26.82
New Jersey	5.59	10.68	10.52	26.79	24.45	18.04	52.80	13.13	20.02	26.19
Pennsylvania	5.21	12.01	11.51	28.73	28.76	18.87	47.92	11.95	20.86	27.94
Delaware	5.06	11.65	12.28	28.99	33.41	23.03	60.78	9.37	31.77	29.14
District of Columbia	7.04	9.41	5.30	21.75	19.66	20.39	0	11.99	13.18	19.16
Maryland	4.63	11.17	10.02	25.82	28.31	16.61	21.58	12.37	21.99	25.80
West Virginia	4.28	12.16	10.32	26.76	20.38	21.30	51.23	10.78	21.52	26.09
Middle Atlantic	5.42	11.61	10.66	27.71	26.76	19.45	53.99	11.25	21.04	27.03
Virginia	3.84	11.08	10.73	25.65	21.47	22.60	14.59	19.58	20.07	25.01
North Carolina	4.02	9.39	9.08	22.49	21.42	16.14	59.03	14.74	22.07	22.42
South Carolina	3.95	10.10	9.61	23.27	20.35	15.07	56.62	28.32	23.27	23.27
Georgia	4.23	10.31	10.35	24.89	24.44	18.36	57.89	18.72	24.31	24.77
Florida	5.71	6.80	8.19	20.58	22.60	8.07	50.71	17.61	18.49	20.68
South Atlantic	4.40	9.26	9.47	23.13	21.99	15.11	40.30	19.10	22.26	22.98
Ohio	4.78	13.64	13.44	31.86	33.61	20.15	58.75	13.26	27.80	31.60
Indiana	5.41	15.70	15.66	36.77	41.96	21.27	61.09	29.97	42.05	37.48
Illinois	5.91	14.67	15.01	35.59	38.35	6.53	60.93	17.42	15.71	23.24
Michigan	5.46	15.19	15.23	35.88	35.28	18.99	50.41	10.38	25.06	35.05
Wisconsin	5.98	16.15	16.36	38.02	49.39	16.36	58.04	11.81	35.13	38.78
East North Central	5.15	14.91	15.21	35.27	38.37	7.32	60.45	15.46	20.67	31.60
Minnesota	5.16	21.60	15.86	42.62	59.62	43.11	59.74	37.26	48.90	43.94
Iowa	6.61	18.63	18.55	38.09	45.35	29.27	59.97	35.17	37.05	37.82
Missouri	6.08	14.39	11.81	34.38	43.77	5.48	59.81	28.84	17.80	26.85
North Dakota	8.73	28.10	6.00	42.85	38.55	45.75	60.46	51.95	49.12	46.96
South Dakota	10.67	28.85	1.82	37.34	51.49	39.77	60.37	42.95	44.31	41.84
Nebraska	10.18	21.10	3.75	35.03	56.10	42.23	61.74	44.15	52.45	49.76
Kansas	10.09	21.66	5.44	36.98	51.88	40.17	60.46	41.09	41.34	39.70
West North Central	7.19	18.20	10.15	37.74	48.64	19.86	59.98	41.71	31.46	35.87
Kentucky	4.66	11.73	11.54	27.93	34.70	23.10	55.12	38.83	32.13	28.73
Tennessee	5.01	11.80	11.09	27.90	37.64	25.41	59.26	20.06	37.13	29.79
Alabama	3.93	10.75	8.43	23.11	30.66	10.25	59.35	34.88	22.69	23.00
Mississippi	5.71	9.66	8.18	23.59	37.47	12.16	58.79	43.73	30.59	27.49
East South Central	4.62	11.00	9.62	25.24	32.66	15.30	58.19	31.07	29.00	26.43
Arkansas	6.19	12.88	10.91	31.98	38.04	16.54	60.08	36.62	41.71	37.02
Louisiana	6.48	13.03	10.23	29.74	40.00	17.57	57.98	32.65	36.01	32.63
Oklahoma	7.42	16.43	6.75	30.60	40.61	23.23	59.19	40.91	29.67	30.19
Texas	7.67	14.84	7.17	29.68	45.13	28.07	57.91	38.07	38.33	34.00
West South Central	7.09	14.10	9.15	30.45	41.84	26.85	59.71	38.17	38.01	34.13
Montana	9.98	21.14	.96	32.08	36.58	43.31	60.40	43.76	41.73	40.60
Idaho	14.05	16.11	8.66	32.82	35.70	40.47	60.89	39.74	38.12	37.63
Wyoming	10.93	23.06	1.85	35.84	32.77	46.03	60.40	51.86	48.25	42.73
Colorado	11.12	19.13	6.12	36.37	38.81	45.20	57.18	44.05	42.13	40.98
New Mexico	14.64	18.08	8.57	35.29	61.10	35.34	60.40	36.89	43.58	43.38
Arizona	13.95	16.78	3.10	33.83	37.06	35.13	54.45	32.75	35.87	35.62
Utah	10.36	12.75	3.69	26.78	36.43	40.90	60.40	44.83	37.73	36.11
Nevada	7.83	11.18	4.20	23.21	23.23	40.06	0	30.80	29.56	27.47
Mountain	10.36	17.62	3.66	31.46	37.24	40.82	56.16	36.69	38.68	37.28
Washington	7.86	14.64	11.02	33.52	37.90	34.29	58.61	32.90	37.21	36.37
Oregon	8.64	15.62	9.67	33.93	28.71	21.71	60.69	38.17	30.82	31.36
California	10.53	10.50	6.18	27.19	30.20	26.62	58.20	12.73	21.36	24.10
Pacific	10.04	11.42	7.05	28.51	30.25	27.09	57.01	15.11	25.41	26.01
Continental U. S.	5.28	12.18	11.19	28.65	32.69	16.53	55.47	22.60	27.42	28.27
Hawaii	11.86	7.99	16.85	36.70	23.15	20.28	59.59	57.69	29.96	32.96
Puerto Rico	11.77	5.96	10.08	27.81	23.54	21.61	55.50	22.00	23.58	26.87
Alaska 5/	---	---	---	---	---	---	---	---	---	---
Territories	11.79	6.50	11.87	30.16	23.31	20.48	59.54	46.90	27.75	29.25
U. S. Average:										
1955-56	5.39	12.08	11.20	28.67	32.35	6/ 16.55	55.64	20.71	6/ 27.43	6/ 28.50
1954-55	5.24	11.86	10.80	27.90	31.00	6/ 19.37	54.56	21.64	6/ 27.00	6/ 27.90
1953-54	5.01	11.54	10.32	26.87	30.81	15.70	54.01	17.53	25.99	26.91

1/ Including materials not guaranteed to contain one or more of the primary plant nutrients, N, P_2O_5, or K_2O. 2/ Guaranteed to contain two or more of the primary plant nutrients. 3/ Guaranteed to contain one of the primary plant nutrients. 4/ Including 2 percent of the colloidal phosphate and 1 percent of the phosphate rock marketed for direct application. 5/ Not available. 6/ Revised: See table 6, footnote 6 for basis of revisions.

WASHINGTON REPORT

(From Page 62)

Persistent spot infections of the Mediterranean fruit fly continue to show up in Polk County, Florida. At time of writing, no new infestations had shown up in the East coast or in southern Florida for a 90-day period.

Officials in Washington are not unduly alarmed about the spot outbreaks in Polk County, since this is the time of year when any carry-over infestations are most likely to show up. However, the continued recurrence of this pest brings to mind the warnings made by many scientists that complete eradication in Florida was nigh-on to impossible, and that we must learn to live with spot outbreaks for many years to come.★★

FUNGICIDE TESTS

(*From Page 47*)

Concluding Section in August

failed to control leaf blights, like the checks, had a significantly lower specific gravity which simply means they were less mature at harvest. This was particularly true of Exp. material No. A670 which had the lowest yield and the lowest specific gravity. Tennam may have lowered the density also. (Table 85.)

Cotton

VERTICILLIUM WILT

A comparison of five soil fumigants made in replicated small plots at State College, New Mexico by Chilton resulted in satisfactory control only with Chloropicrin at 35 gallons per acre. The unsatisfactory materials and rates of application were ethylene dibromide, twelve gallons per acre; Vapam, twenty-five gallons; methyl bromide, four pounds per one hundred square feet and ONCB (Orthonitro-chloro-benzene, 25% granule) at fifty pounds. (24.)

Tobacco

DOWNY MILDEW

At Quincy, Florida, Kincaid made a replicated plant bed test of four materials for mildew control with zineb and maneb dusts made up with a special brown diluent made from tobacco. Although the two stronger dusts, Manzate and Dithane M22 gave best disease control they were rated the lowest because of phytotoxicity and lower yield of usable seedlings per square yard. The two fungicides recommended are Dithane Z78 and Parzate. (Table 87).

BLUE MOLD

Control of blue mold in Florida shade area seed beds has been quite satisfactory in the past with 15% ferbam with its high margin of safety, and more recently with zineb. In 1956 Parzate 6.5%, Dithane M22, and Manzate 7.0% gave much better control than the standard Dithane Z78—6.5% dust. Pyrophyllite gave better control than a tobacco diluent used for comparison. Streptomycin sulfate .5% also gave good control when used with pyrophyllite diluent, according to Kincaid. (Table 86.)

South Carolina Report

In a comparison of four fungicides applied as sprays at three concentrations, once a week and twice a week, to seed beds in South Carolina, Holdeman found that zineb and ferbam were better than Streptomycin sulfate. Zineb at three pounds was better than two pounds and two applications per week were better than one, but four pounds of ferbam twice a week was about equal to three pounds of zineb. All treatments were safe even up to 200 ppm of the antibiotic + 1% glycerine applied twice a week. All treatments applied only once a week gave unsatisfactory control except zineb at three pounds. (Table 88.)

TABLE 86

Blue Mold Control Tests with Dusts in Tobacco Seed Beds at North Florida Experiment Station (13)

Fungicide	% Active	Diluent	Disease Index Mar 31	Disease Index Apr. 3	Final Stand per sq. yd.
Dithane Z78	6.5	Pyro.	1?	7	355
Dithane Z78	6.5	Tob.D.	5	45	398
Parzate	6.5	Tob.D.	t	2	405
Dithane M22	1.75	Pyro.	4	11	391
Dithane M22	1.75	Tob.D.	25	70	445
Dithane M22	3.5	Tob.D.	t	5	453
Dithane M22	7.0	Tob.D.	t	t	357
Manzate	7.0	Tob.D.	t	t	388
Strep. sulph.	0.5	Pyro.	t	23	428
Strep. sulph.	0.5	Tob.D.	98	100	317
Strep. sulph.	1.0	Tob.D.	63	93	330
Check			100	68	332

TABLE 82

Dosage Rates of Kemate (B622) or Dyrene in Relation to Tuber Rot, Yield, and Specific Gravity on Long Island Green Mountain Potatoes (31).

Lbs./100 gal.	Bu./acre	% Tuber Infection	Sp. Gravity
8	401	0	1.0833
6	362	0	1.0840
2	342*	1.27	1.0843
4	336*	0	1.0835
0	227*	6.81	1.0805

*Difference between this treatment and poorest is significant at 5% and 1% levels respectively.

TABLE 83

Fungicides For Late Blight Control on Long Island (31).

Materials	Rate/100 gal.	Defol. Rating†	Tuber Inf. at Harvest
Chem. Bam	2 qts.	5.25	.00
D-14 + $CuSO_4$	2 qts.—1 lb.	4.00*	.01
Manzate	1½ lbs.	4.50	.08
D-14 + $ZnSO_4$	2 qts.—1 lb.	5.00	.16
Bordeaux	8 lbs.—4 lbs.	4.50	.47
Tribasic	4 lbs.	4.75	.48
Calumet	2¾ lbs.	4.25	.85
D-14 + $MnSO_4$	2 qts.—1 lb.	4.75	1.13
Omadine (Zn)	2 lbs.	4.00*	1.19*
M - 22	1½ lbs.	3.75**	2.38**
Vancide M	2 lbs.	3.50**	4.47**
A - 670	1 lb.	1.75**	6.27**
Tennam 5	2 lbs.	2.75**	6.80**
Check		1.00**	7.26**
Tennam 7	2 lbs.	3.50**	8.95**

†Defoliation readings; 1= vines dead, 6= vines green.
* and ** differences between this treatment and poorest significant at 5% and 1% level repsectively.

TABLE 84

Captan Dosage Series in Relation to Yield and Specific Gravity on Green Mountain Potatoes (31).

Lbs./100 ga	Yield Bu/a	% Infected Tubers at Harvest	Specific Gravity
8	342	.01	1.0854
6	331	.01	1.0836
4	331	.01	1.0848
2	315	1.00	1.0824*
3	313	.21	1.0820**
0	248**	16.19	1.0788**

* and ** Difference between this treatment and poorest significant at 5% and 1% level.

TABLE 85

Fungicide Trial on Long Island Potatoes in Relation to Yield and Specific Gravity (31).

Material	Rate/100 gal.	Yield Bu./A.	Sp. Gr.
D-14 + $ZnSO_4$	2 qt.—1 lb.	316	1.0835
Tribasic	4 lbs.	311	1.0813
Chem. Bam.	2 qts.—1 lb.	300	1.0835
D-14 + $MnSO_4$	2 qts.—1 lb.	275	1.0815
Omadine (Zn. salt)	2 lbs.	275	1.0828
Manzate	1½ lbs.	272	1.0840
Dithane M-22	1½ lbs.	272	1.0823
Tennam 5	2 lbs.	268	1.0798
Bordeaux	8-4-100	265*	1.0803
Calumet Cu Oxide	2¾ lbs.	262*	1.0813
D-14 + $CuSO_4$	2 qts.—1 lb.	258*	1.0825
Vancide M	2 lbs.	250*	1.0818
Tennam 7	2 lbs.	242**	1.0813
Exp. Fung. A670	1 lb.	209**	1.0768**
Check		170**	1.0775**

* and ** Differences significant at the 5% and 1% level.

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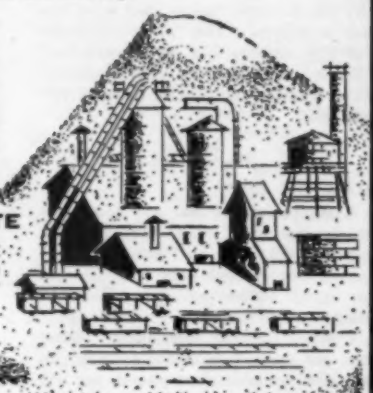

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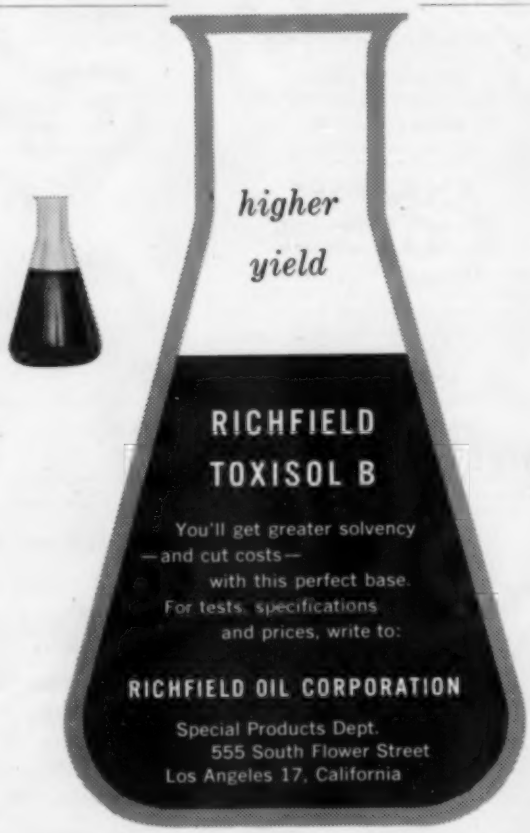

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Rates for classified advertisement are ten cents per word, $2.00 minimum, except those of individuals seeking employment, where the rate is five cents per word, $1.00 minimum. *Check must accompany all classified advertisements.* Address all replies to Classified Advertisements with Box Number care of AGRICULTURAL CHEMICALS, P. O. Box 31, Caldwell, N. J. Closing date: 10th of preceding month.

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INSECT ACTIVITY

(*From Page 55*)

The first codling moth larvae hatched at Vincennes, Indiana, May 18. Development was generally slow. At Carbondale, Illinois, 50 per cent of the larvae were dead due to weather conditions. By late May, emergence was more than 50 percent in Delaware and Ohio and moths were taken in Kansas, Utah and Oregon.

Brood XIV of the periodical cicada had been seen and heard in several states by the latter part of May. Large numbers of the cicada were reported in the Norris Dam area of Tennessee, and throughout the eastern half of that state. Damage was caused by egg-laying in Caldwell County, North Carolina. The insect was also abundant in several other counties of the state. Emergence in Northumberland County, Pennsylvania, was observed May 17. No damage had been noted in the state by the first of June. In Indiana, adults emerged about May 12 at Nashville, and May 21 at Orleans.

Populations of the insect were less than on the earlier survey east of the mountain range in Wyoming and Nebraska, but on the increase on the eastern slope in Colorado. All indications point to a severe yellows epidemic in the Colorado, Nebraska Wyoming area this season. Populations were low west of the Rocky Mountains.

By late May, mosquitoes were becoming a problem in several states that have been receiving excessive rains. In Texas, mosquitoes were numerous over most of the state. In southeastern Arkansas the insects were severely attacking cattle. Increase was also noticeable in other flooded areas of the state.

Screw-worm cases were reported from Lincoln, Columbia and Crawford Counties, Georgia in late May. All cases were in calves.

Alfalfa Weevil Spreads

The alfalfa weevil continues to spread. In May, one adult specimen was taken in a newly-established alfalfa field in New Haven County, Connecticut. This is a first record for that state. Several new county records were reported from New York and Pennsylvania. The pest continued to cause damage in Maryland, Pennsylvania, South Carolina, Virginia and North Carolina. Activity was reported the last week in May from Nebraska and South Dakota and damage from Utah and southern Idaho.

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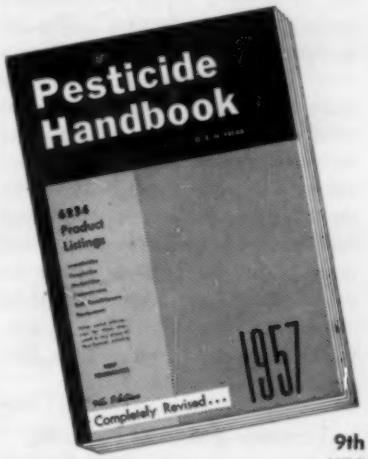

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Dr. Donald E. H. Frear, Editor of PESTICIDE HANDBOOK 1957, is one of the leading authorities on the chemistry of pesticides. He is the author of "Chemistry of Insecticides and Fungicides," the first book dealing with this subject published in the United States. In addition, he has written several other books, including "Chemistry of Insecticides, Fungicides, and Herbicides." Dr. Frear is Professor of Agricultural and Biological Chemistry at The Pennsylvania State University.

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FERTILIZER MARKET

(*From Page 37*)

E. T. York, Jr., American Potash Institute, in analyzing the fertilizer market, said "the fertilizer industry can play a vital role in showing the farmer the advantages of using fertilizers to attain more efficient levels of crop production." The job is two-fold: to encourage and promote research aimed at developing know-how in fertilizer usage; to offer information on the correct levels of fertilizer needed for most efficient production. Historically, Dr. York said, such research has paved the way for increased fertilizer use. Then, there is the real task of getting the information to the farmer so that he can see the benefits and will be willing to adopt these improved fertilizer practices.

Economic Aspects of Fertilizing

AN optimistic note on fertilizer sales was also voiced by Gordon B. Nance, professor of agricultural economics, University of Missouri, who predicted an increase in the use of fertilizer in the next decade which will be two or three times as rapid as it was in the past ten years. "The plant food industry has a growth potential much greater than that for any industry I know . . . either established or new," he observed.

As an economist, Mr. Nance, indicated that fertilizer pays dividends that are almost unbelievable to business investors, in general, or farmers. He pointed out that investors are normally more than satisfied with returns of 4 or 5 per cent. By contrast, the returns offered from increased fertilizer use, Mr. Nance reported, can run as high as 290 per cent when fertilizer is applied to below-average land in the corn belt. "The profitability of using fertilizer has been established and demonstrated for as long as I can remember, which is for more than a half century," he said.

As contrasted with this valid basis for using more fertilizer, Mr. Nance referred to some reasons advanced as to why farmers continue to buy so little fertilizer when it pays so well. "One is the risk involved—they fear a bad weather year in which they will not get their fertilizer money back," he said. "If this is true, it is indeed strange that they raise, buy and feed cattle and sheep, which on the average return $1.24 for each dollar's worth of feed used, and in one year in five do not even pay all of that dollar back. Also, if they have a bad cattle or sheep year, their loss is irretrievable — the money is gone. But if a drought prevents fertilizer from paying out one year, most of it is available for the next year's crop.

"A second reason advanced is that lack of money and credit limits fertilizer sales. I'm not impressed with this either. Farmers liabilities are only 11 per cent of their total assets, and less than their liquid assets—money, bonds, etc. Of course, some farmers lack the money or credit to buy the needed plant foods, but the number is indeed small. Some time ago I asked a country banker, whose patrons are mostly farmers, the percentage of his farmer patrons that he would not be willing to lend all the money they needed for full fertilization of all their crops. He said he would refuse such loans to less than 1 per cent of his farmer patrons. I'm morally certain that if farmers who have the required cash or credit bought all the fertilizer they could use profitably, they would buy 5 or 6 times as much plant food as is now produced." He also pointed out that "another possible reason for the small use of fertilizer may be the lack of salesmanship."

The three day meeting of NPFI concluded with the presentation of scrolls to the winners in the Institute's nationwide "Soil Builders Award for Editors" contest. Two editors honored were Carrol P. Streeter, editor of *Farm Journal*, and W. Kennedy, of *The Georgia Farmer*.

At the annual business session, twelve new members were elected to the board of directors for terms expiring in 1960, and two members to the board to fill unexpired terms.

For terms expiring in 1960 the following were elected:

Charles W. Baldwin, United States Steel Corporation, Pittsburgh,; L. G. Black, Ark-Mo Plant Food Co., Corning, Ark.; T. F. Bridgers, Farmers Cotton Oil Co., Wilson, N. C.; Peter Colefax, American Potash & Chemical Corp., Los Angeles.; Ralph B. Douglass, Smith-Douglass Co., Norfolk, Va.; Sidney Ellis, Commercial Solvents Corp., New York; Robert U. Haslanger, Escambia Chemical Corp., New York; Stanley Learned, Phillips Petroleum Corp., Bartlesville, Okla.; A. W. Mohr, California Spray-Chemical Corp., Richmond, Calif.; W. T. Steele, Cooperative Fertilizer Service, Inc., Richmond, Va.; James E. Totman, Summers Fertilizer Company, Baltimore; Thomas M. Ware, International Minerals & Chemical Corp., Chicago.

D. H. Banks, Sr., Banks Fertilizer Co., St. Matthews, S. C., was elected to the board to fill the unexpired term of George W. Gage, Anderson, S. C., expiring in 1958, and John Christian, Monsanto Chemical Co., Inorganic Chemicals Division, St. Louis, was elected to fill the unexpired term of A. Frank Reed, of the same company.

The board also elected C. T. Prindeville, Chicago, as chairman of the Board, and John A. Miller, Louisville, Ky., as president of NPFI for the fiscal year 1957-58. Mr. Prindeville is vice president of Swift & Company, and Mr. Miller is president of Price Chemical Company.

COOPE STATEMENT

(*From Page 35*)

same view and intend to take the same action.

"I assure you that we have come to this conclusion with the greatest regret as we all have the highest regard for the Plant Food Institute and have valued our membership in it. Indeed, if my company is forced to resign for this reason, we would nonetheless be reluctant to withdraw our support and would like to continue our present financial contributions, that is, the same amount we are now paying, on some basis satisfactory to the institute, such as through an associate membership.

"I am also authorized to make this statement for the following potash producers as well:

American Potash & Chemical Corp.
Duval Sulphur & Potash Co.
National Potash Co.
Southwest Potash Corp.
U. S. Potash Co., Div. U. S. Borax & Chemical Corp."

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TALE ENDS

THERE has been a certain amount of confusion in the pesticide trade over the past few months as to the exact status of methoxychlor as an acceptable ingredient in cattle sprays, ever since the subject came up at the annual meeting of the North Central Branch of ESA in Des Moines back in late March. In a discussion of insecticide residues there, it was observed that since no tolerance has been established for methoxychlor in milk, the product can no longer be safely recommended for use on dairy cattle unless it can be demonstrated that no residue will result or until such time as a residue tolerance is established.

Some suppliers of methoxychlor point out that the Pesticide Regulation Section of U.S.D.A., which is the unit in charge of administering the Federal Insecticide, Fungicide and Rodenticide Act, has taken no action to rescind acceptance of label claims for methoxychlor formulations on dairy cattle, which still remain in full effect. They observed, too, that extension services generally have not changed their recommendations, and are continuing to suggest methoxychlor as the best insecticide for controlling horn flies on dairy cattle.

A petition has been filed under the Miller amendment covering the use of methoxychlor on dairy cattle, and it seems probable that no change of existing label claims for methoxychlor as a cattle spray ingredient will be made by the Pesticide Regulation Section of U.S.D.A. until the pending petition has been acted upon one way or the other. A final check at press time revealed that the petition had not been acted upon as late as mid-June, although an early decision is anticipated. Meanwhile status quo seems to obtain.

AC

Should methoxychlor receive a serious setback for cattle spray use, this would give a big sales boost to pyrethrum, and to the new insect repellents. Repellents, by the way, are currently attracting more attention than for several years past. The availability of a number of new, more efficient and long lasting active ingredients is the immediate stimulus. See our article on the subject in the June issue.

AC

Several other interesting new products should perk up sales for pesticide manufacturers this season. There is considerable interest in gibberellic acid, and formulations of this new growth stimulant are beginning to appear on the horticultural market. It seems to be a natural for the aerosol method of application, which may make more firms in the home garden field prospective candidates for pressurized packaging.

AC

An expanded market for pyrethrum is seen in Germany, where the German pure food and drug act is reportedly being rewritten along the lines of the current version of the U. S. Insecticide, Fungicide and Rodenticide Act.

AC

Len Gopp, a refugee from the insecticide business who has been devoting his talents to expanding phosphate chemical sales for IMCC for the past couple years, called our attention to the true meaning of the world "symposium" just after we wound up a particularly intensive and stimulating symposium at the recent Plant Food Institute session at White Sulphur. "Symposium," according to Len and Webster's New Collegiate Dictionary, is "a drinking party, feast . . . a drinking together, usually following the banquet proper, with music, singing, and conversation." What, no dancing?

AC

The newspaper fraternity recognizes Winchell as the father of the mens room school of journalism. He would have had a field day at White Sulphur last month, what with the numerous "gents' room" discussions of advancing nitrogen prices, the "potash rebellion," etc. Your agent has often found, however, that the top spot for checking in on live reportable material is not the rest room itself, but rather just outside the door. One good finishing line to what must have been a full and frank discussion was culled at the Greenbrier, — to wit "I don't need any more tonnage. I just want to get paid for what I sold in '56."

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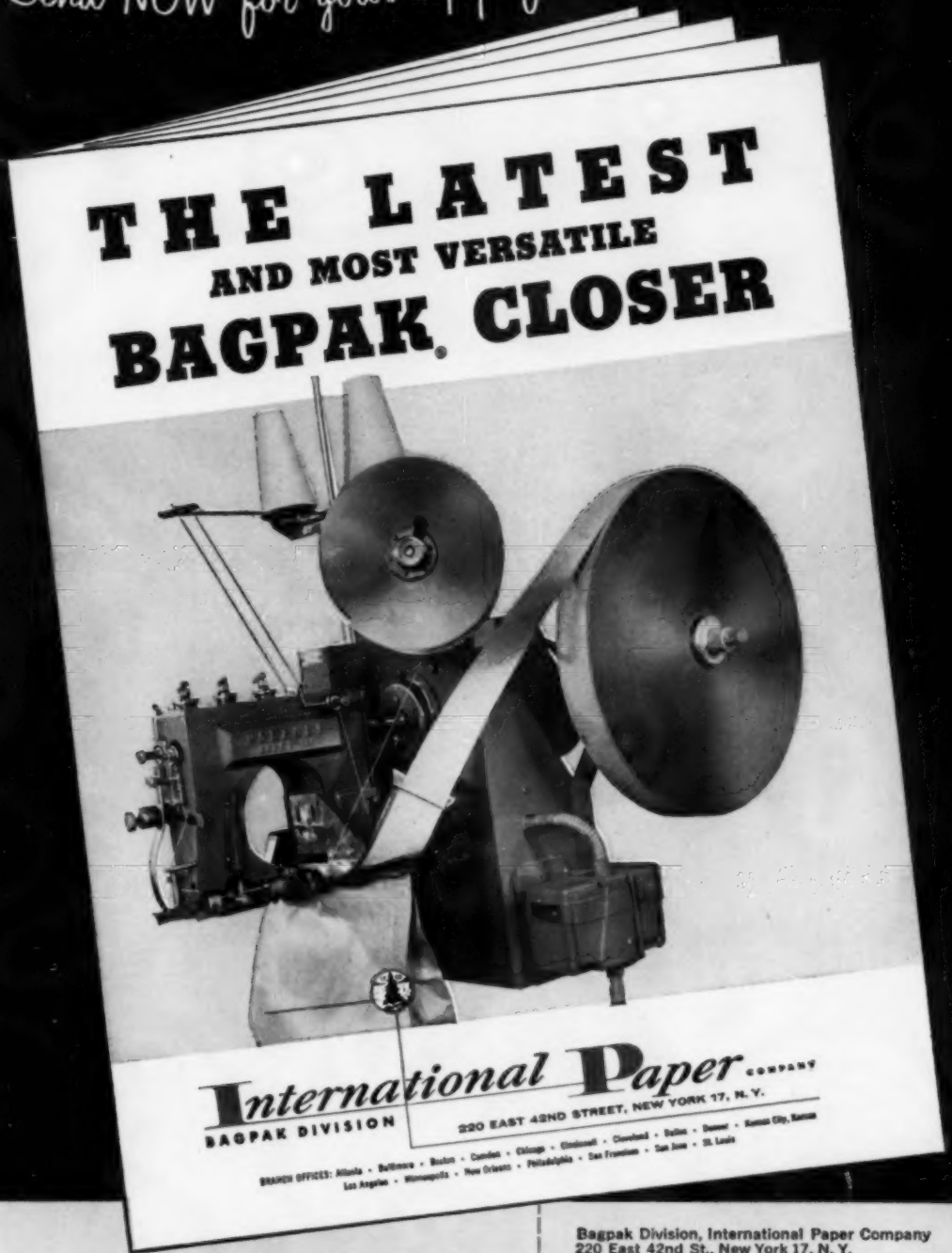

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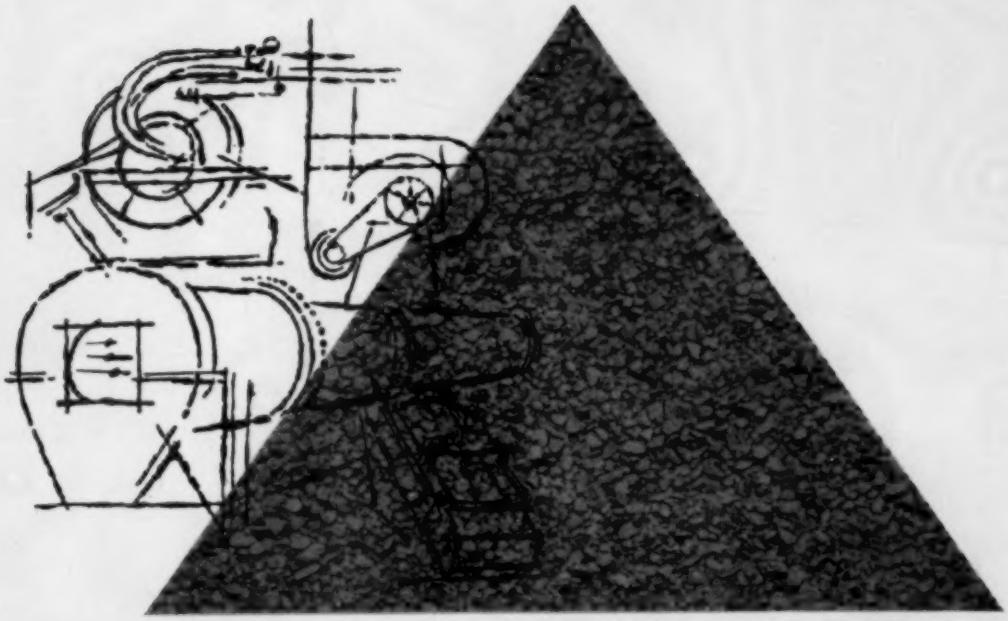

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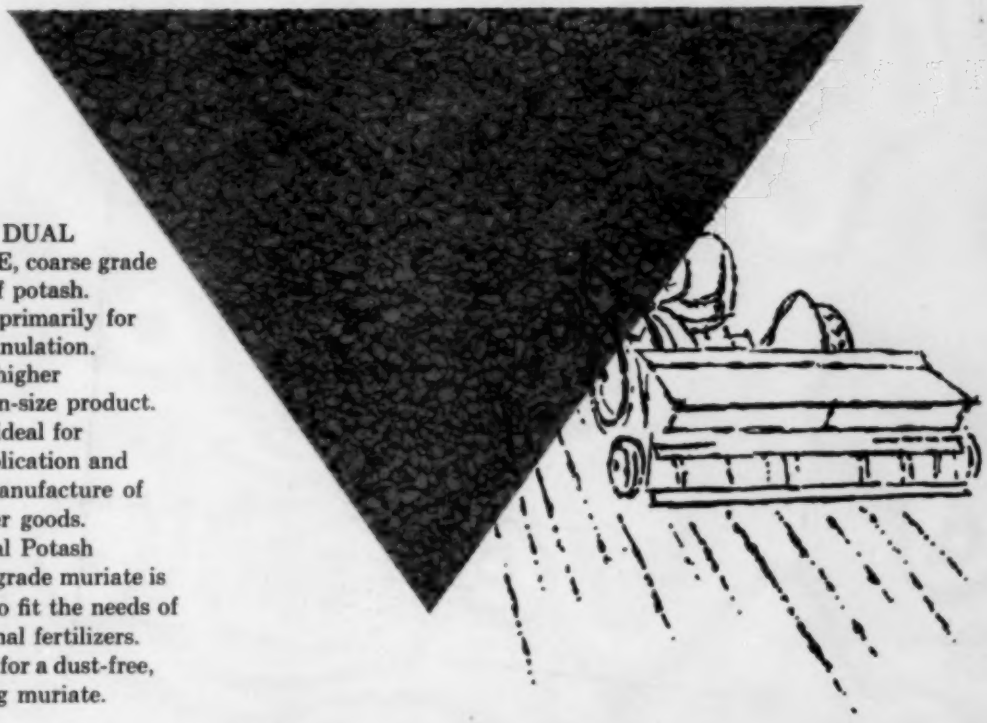

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